SCIENTIFIC AMERICAN

[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLVII.—No. 12. [NEW SERIES.] NEW YORK, SEPTEMBER 16, 1882. [$3.20 per Annum. [POSTAGE PREPAID.]

IMPROVED BOAT-LOWERING APPARATUS.

The necessity of an efficient boat-lowering apparatus must have been impressed upon any one who has from time to time read of marine disasters, in which the loss of life has been doubled by the imperfection or disarrangement of the boat-lowering apparatus. In fact, it may be said that too frequently the sole cause of loss in such cases is the lack of proper appliances of this character.

We give below an engraving of a new apparatus for lowering and raising boats, recently patented in this country, also in Canada, England, France, and Germany, by Mr. R. H. Earle, of St. Johns, Newfoundland. In the engraving Fig. 1 shows the boats being lowered. Fig. 2 shows the davit in use as a life ladder resting against the ship's side. Fig. 3 shows the davit with the cradle detached, containing a man who is in the act of picking up a child. The davit is shown lifting a boat full of people in Fig. 4. Fig. 5 shows the davit acting as a spar keeping the boat from the ship's side, and taking persons on board during a storm; and Fig. 6 shows the appliance in use as an ordinary davit.

This apparatus, while very simple in its construction and easily operated, performing all the functions of the ordinary davits, is at the same time efficient in so many other ways as to place it at the head of devices of its class.

It is a very much needed invention, and its adoption will undoubtedly be the means of saving thousands of lives not only at sea but wherever boats are used. The inventor informs us that expert sea captains who have examined this appliance assert that every boat on a ship fitted with this device could be filled with passengers and lowered within from one to two minutes from the time of the occurrence of the accident.

This apparatus is not only wonderfully rapid in its operation, but it guarantees absolute safety to the passengers. After launching the ordinary ship's boats the life rafts may be lowered, or if the ship is so fortunate as to be equipped with the well known collapsible boats invented by E. L. Berthon, M.A., of England, these boats could be readily placed in the cradle, filled with passengers, and quickly launched, thereby saving many lives that would otherwise be lost.

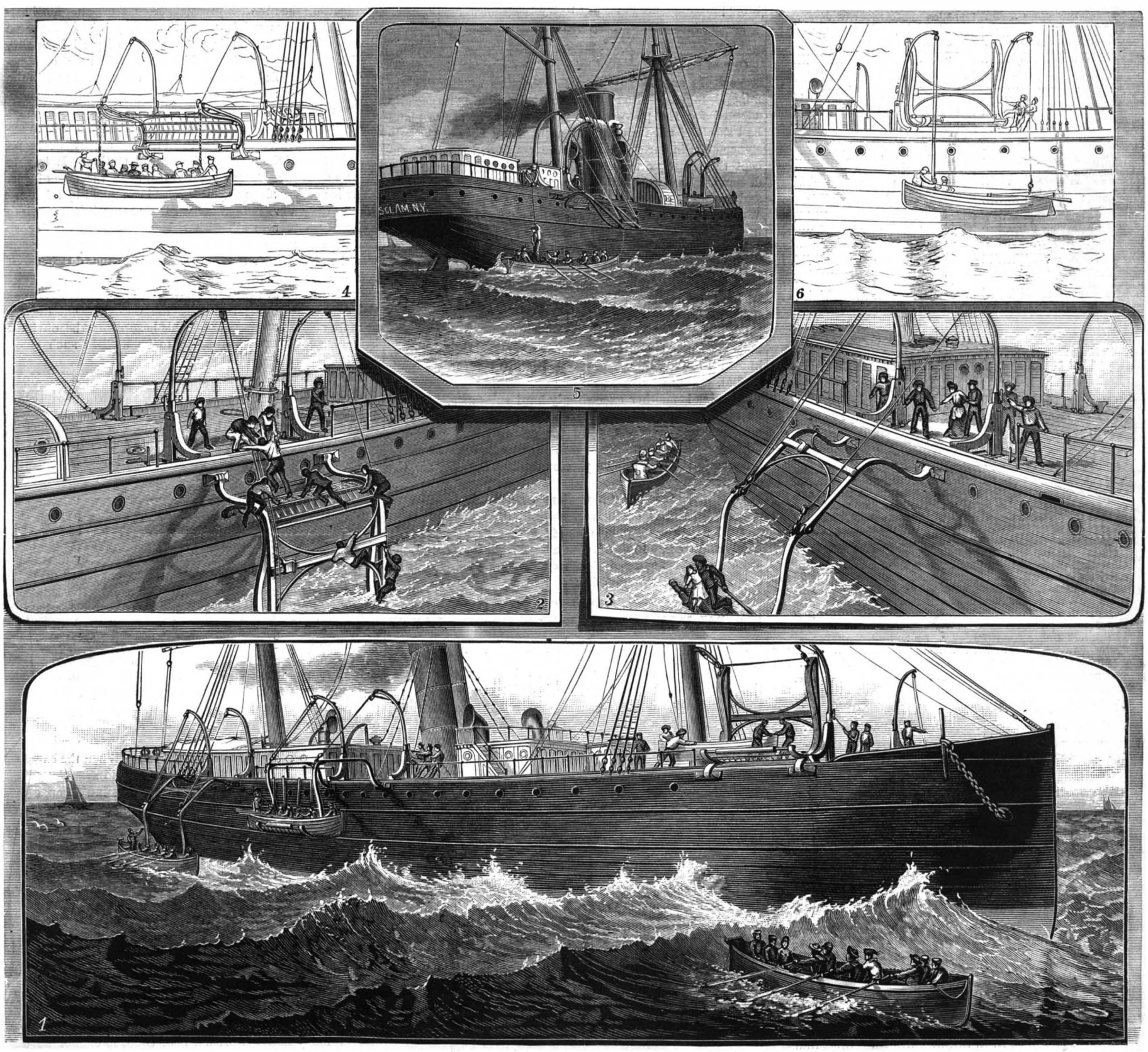
The preparations necessary to lower the boat with this apparatus are exceedingly simple. When an accident occurs the covering attached to the boat is thrown off, when the passengers take their seats, and all is ready. Then the levers which hold the boat and the lowering appliance rigidly to the deck are instantly unloosed, and the boat is immediately lowered to the water. Clearing the decks thus quickly quells excitement and gives assurance of safety to passengers, enabling the officers of the ship to maintain order and discipline, a thing of rare occurrence when the ordinary and tardy means of boat lowering are employed.

The dashing of the boats against the ship's side, lowering one end of the boat before the other, jumping into boats, the cutting of the boat's ropes by sailors and rowing away without passengers, are all impossible where this improved appliance is employed.

In this improved system of boat lowering a great saving in labor is effected. With the ordinary plan it requires ten to fifteen persons to lower and attend to each life-boat; in the new apparatus no lifting is required, and four or five persons are sufficient to the task. This is extremely important, especially in the case of steamers, where comparatively few men are employed.

For military transport, where rapidity, safety, and secrecy are indispensable, this invention will prove of great value. And in times of collision the swinging davits will be of inestimable value.

Further information in regard to this invention may be obtained by addressing R. H. Earle, 316 Water street, St. Johns, Newfoundland, or Earle, P. O. box 1177, New York city.



EARLE'S BOAT LOWERING AND RAISING AND LIFE SAVING APPARATUS.

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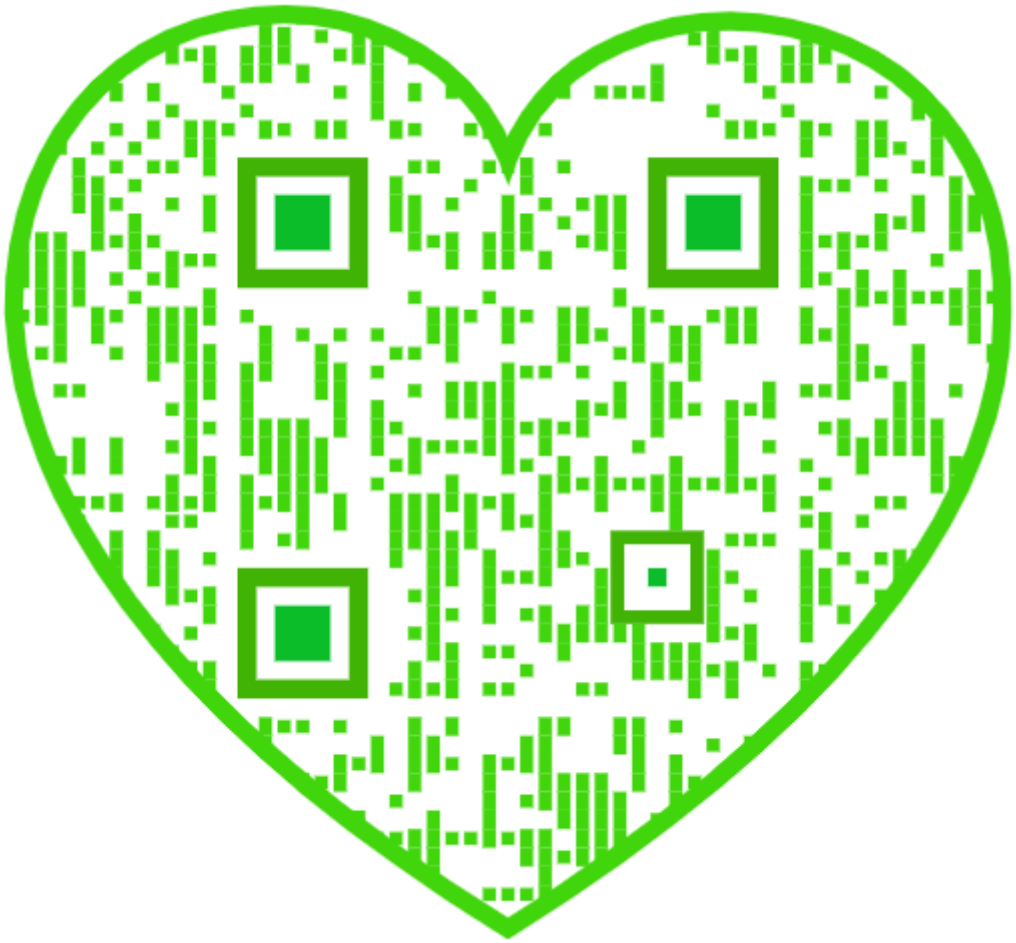

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, SEPTEMBER 16, 1882.

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ONE HAS-DONE-IT BETTER THAN THREE CAN'T-DO-ITS.

In a recent infringement trial in this city, in the U. S. Circuit Court, Judge Blatchford presiding—subject, the manufacture of rosaline colors, Patent 250,247, the defendants claimed that they were not infringing, and that the alleged coloring matter could not be produced by the process set forth in the patent.

In support of this position they presented the evidence of three learned doctors, namely: Prof. Morton, to the effect that the patented color was not made by following the directions of the patent. Professor Chandler was also of the opinion that the new color was not produced in the way directed by the patent. Prof. Eudesmann also said he had found that the improved article could not be made by following the specification. But neither of the doctors informed the court what sort of stuff they could make by practicing the new invention; and they furthermore admitted, tacitly, that the article made by the defendants did not differ from the article claimed by patentee.

On behalf of the inventor, Prof. Seeley produced as an exhibit a specimen of the new color, which he had made by following the process set forth in the patent; he also testified that the infringing substance was identical with the patented article.

It also appeared in evidence that when the inventor applied for the patent, there had been some interference proceedings, in the course of which Professors Morton and Chandler testified at that time that they had not been able to produce the patented article, although they had followed the directions of the patent. Therefore, the Patent Office required the inventor to make an actual demonstration of the practicability of his invention, which he did.

In the presence of the examiner, he carried out practically the method described in his specification, and the result was, the production of a true rosaline salt, as claimed. The Commissioner consequently disregarded the evidence put in by the two professors, and decided the case in favor of the inventor. The Circuit Court now confirms the correctness of the Patent Office decision, and we suppose that the defendants' three professors are at liberty to try the process again.

MICA.

One of the chief uses of mica at the present time is for stove doors and lanterns, the fire-resisting qualities of the mineral, together with its transparency, rendering it specially adapted for the purpose. But only the very clearest and best sheets of mica can be thus used. Vast beds of the substance exist in various parts of the country, for which, except the finest portions, as above mentioned, there is little demand. New uses will, however, doubtless be discovered and invented, for mica is made up of valuable materials. We notice among the recently granted patents two inventions in this line. One is for the manufacture of journal boxes of cement, ground mica, and flour; the ingredients are mixed, pressed into shape, and then baked. The other is an apparatus for reducing mica to an impalpable powder and preparing it for use as a mixer in starch gloss and oily compositions.

Chemically regarded mica is made of silica, alumina, and potash. Silica is one of the hardest substances in nature, known in its purest and most beautiful form as rock crystal.

Alumina is another exceedingly hard substance. One of its most useful but impure forms is emery or corundum, now so extensively employed for grinding and polishing purposes. The most elegant and purest examples of silica are seen in the well known precious stones, the ruby and the sapphire.

Potash, the remaining ingredient of mica, is familiar to everybody, and is extensively used in the arts. Our commercial supplies of potash chiefly come from the ashes of plants and trees, and their roots take it from the ground, the granite rocks being the original source. Granite is composed of quartz, feldspar, and mica.

GENERAL INCANDESCENT ELECTRIC LIGHTING IN NEW YORK.

While the lighting of detached buildings by incandescent electric lamps is a familiar sight in this city, the inauguration of a general system of incandescent electric lighting, from a central station, may fairly be regarded as marking the beginning of a new epoch in social economy.

To those who had critically followed the development of the multiple arc system of Mr. Edison there was no apparent cause for doubting its entire practicability when applied to general public lighting. Still to the multitude the final demonstration of actual service throughout a considerable area, under the complex conditions encountered in a city district, covering many streets and blocks of houses, was necessary to give assurance that the whole matter was not more or less speculative.

The great steam dynamos at the central station of the first district were started in concert on the afternoon of Monday, Sept. 4, and from that evening the new system of interior lighting has been one of the established institutions of the city. To a large extent gas light has been supplanted throughout the district, and there is no reason for doubting the extension of the new light to other districts as rapidly as the requisite central stations and systems of electric conductors, lamps, meters, and other appliances, can be produced

At any rate the new system has passed three of the four essential stages of progress toward commercial permanence and success.

When Mr. Edison first attacked the problem of incandescent electric lighting he was met with the general objection of electrical authorities that a durable incandescent electric lamp could not be made. When he proposed to subdivide the electric current, so as to multiply small lamps economically, he was warned on all sides that he was in pursuit of an impossibility; the thing could not be done. Having produced the desired lamp and subdivided the current experimentally, his critics not less confidently asserted that a laboratory experiment was one thing, the practical application of a theory to a complex system of public service was quite another, and he was bound to fail. It was a question of economy, and admitting that an incandescent electric lighting system could be furnished under the conditions required it would not pay. On this point the company which have furnished the means for the inauguration of the system in the district now lighted by them are probably better qualified to judge than the opponents of the system. It is certainly to be hoped that their expectation of profit in supplying a better light than gas affords, at the same or less cost, will be amply justified.

As the plan of the central station and the general application of the system in the first district have been so recently described in this paper (August 26, 1882), it will not be necessary to dwell upon them here.

Assuming the new light to cost the same as gaslight—and it is not reasonable to expect that those who have assumed the cost and risk attending the development and introduction of the new light will set the price of it below what competition with gas may make necessary—the question is, How are the public to be benefited?

The first and most obvious advantage arises from the quality of the light. It is more nearly like sunlight than any other artificial illuminant. It is free from flickering and unsteadiness—faults which make both the electric arc light and the ordinary gas jet so painful and injurious to the eyes. It does not vitiate the air as gas does, by consuming oxygen and loading the air with products of combustion. Its heating effect is very much less than that of a gas jet of the same illuminating power. It is not a source of peril from fire, the lamp proper being incapable of firing the most combustible fabric; while the low tension of the current makes the formation of arcs and the overheating of conductors altogether unlikely.

Fears as to the continuity of the service have been expressed, but the grounds for them are not apparent after an examination of the plant of the central station. It is true that no system of storage is provided, as in the case of gas. None is needed, since the electricity is supplied by a battery of steam dynamos which deliver their several currents into a circuit common to all, with a large surplus available, so that the stoppage of any of them by accident or for repairs would not diminish the illumination of the district. Of course a general fire about the central station might stop its operation and leave the district in darkness, but the same risk obtains with gas; and after the establishment of two or more centers of distribution this hazard may be obviated by means of connecting mains to be used in such emergencies.

The experience obtained in the running of Station No. 1 will no doubt lead to the introduction of considerable changes in the plan and engineering of subsequent stations; the company are none the less to be congratulated for the wisdom with which they have brought into successful operation an enterprise involving so much of magnitude, complexity, and novelty.

The Pretsch Process for Making Photo Printing Plates.

A sensitive gelatinous mixture is prepared by dissolving 6 parts of gelatine in 30 parts of water, and 1 part of powdered ammonium bichromate is stirred into the solution. A piece of plate glass, which is all the better for having been previously coated with a collotypic substratum, is now leveled in the drying cupboard—a temperature of about 40° C. being suitable in most cases. When the plate has reached the full temperature of the hot cupboard, some of the gelatine preparation is poured on and spread with a strip of paper, about 30 grains being allowed for each square inch of surface. When the plate is dry it is exposed under a negative, about six times the exposure which would be required for a silver print being given. When the exposed plate is soaked in water, the reticulation and granulation of the gelatine rapidly set in, and in a few minutes an exact reverse of the required printing block will result. The next step is to allow the plate to become partially dry, and to deposit copper on it by the electrotype process so as to form the printing block. It is, perhaps, a more certain proceeding to take an impression from the reticulated film by means of softened gutta-percha, and to send this cast to an electrotyper or a stereotyper to be reproduced in metal.

Silk Direct from the Worms.

An unsuccessful attempt was made lately before the New York Silk Exchange to reel silk direct from the worms. The idea is a taking one, and if realized it might prove immensely valuable. Success might open a way to utilize the silk of many native worms whose cocoons cannot be unwound.

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The New Scientific Steamer.

The new iron steamer Albatross, lately launched at Wilmington, Del., for the use of the U. S. Fish Commission, will be ready for sea about December 1. Her dimensions are, length 200 feet, beam 27·6 feet, depth 16·9 feet. She will be provided with two large laboratories, one on the upper deck amidships and the other immediately under this. In these laboratories all the microscopic work will be carried out and preparations made. As ornithology enters into the researches of the scientific party who will be carried out on the Albatross, the best arrangements have been made for the use of the taxidermists.

For dredging and trawling the Albatross will carry 8,000 fathoms of ⅜ inch steel wire rope. The winding engine will be run by two steam engines, and the steel rope will be paid out and wound up by a reeling engine, worked on the lower deck, provided with an automatic arrangement devised by Capt. Z. Tanner, whose experience as commander of the Fish-hawk has made him most proficient in the matter of dredging and trawling. To prevent too great strain an indicator will be used, with apparatus to relieve the tension and to determine at the same time the exact amount of rope in use. The apparatus for deep sea soundings will have some slight improvements on that now in use on the Fish-hawk.

Two Herreshoff steam launches will serve the Albatross as tenders.

One of the launches is of the usual model, the other will carry her propeller amidships in such a way that the screw can be worked either parallel with or at right angles to the keel. These launches will be constructed with bulkheads, so as to serve as life boats, and will be equipped with apparatus for the capture of cetaceans and fur-bearing sea animals. A thirty foot yawl will be carried for use in seining. One novel feature of this vessel for the pursuit of fish will be the use made of the electric light. The two methods employed will be the Brush for surface illumination, and the Edison for lighting up the depths of the sea. Between the Australian fisherman who spears his fish from his canoe, in the bottom of which burns some resinous wood, and a large vessel, illuminating the sea at great depths with the Edison incandescent light, there is all the wide difference between the barbarism of prehistoric time and the civilization of the present. Ventilation will be provided for by a method devised by Mr. G. W. Baird, Passed Assistant Engineer, United States Navy. A No. 6 Sturtevant exhaust is to be run, by which all the foul air is to be drawn out, to be replaced by fresh air.

A distillery apparatus, also invented by Mr. Baird, will supply water. By this process the water is aerated as soon as made, and is potable at once.

The Albatross was designed by Mr. C. W. Copeland, and built by the Pusey & Jones Company, Wilmington, under the inspection of Passed Assistant Engineer G. W. Baird. She will have a brigantine rig, twin screws, will be propelled and worked by a compound engine, steam reversing gear, with flue boilers; is expected to make twelve knots an hour. She will be steered by a steam quarter-master designed by the builders. Her crew will consist of sixty-five men detailed from the Navy. Her chief officer is Lieut.-Commander Z. Tanner. She will carry a lieutenant, surgeon, and ensign officer, and two or three ensigns. Her first extended trip will be to England, to carry to the London Fisheries Exhibition the exhibits of the U. S. Fish Commission.

Irrigation in Egypt.

The American Consul-General at Cairo states that the tillable land of Egypt consists of the delta of the Nile, and a narrow valley extending from Cairo southward. This valley is generally from one to ten miles wide, though for about one hundred and fifty miles above Cairo it has a width of from ten to thirty miles. Both the delta and the valley, except so far as the former borders on the Mediterranean, are bounded on all sides by mountainous deserts, and for more than two thousand miles from its mouth the river has not the smallest tributary.

It rolls on toward the sea, unlike other rivers, constantly decreasing in volume. As there are no rains of any practical importance, it sustains all vegetation, and all the inhabitants of Egypt and its herds drink of its waters. For two or three months in the year, a considerable portion of the country may be irrigated by the natural rise of the river, but with the exception of certain sections, the water is not permitted to flow freely over the land. It is taken from the river and conducted by canals alongside the fields where it is to be used, and spread over the different parcels of land, if it is sufficiently high, and if not, it is raised by some of the various modes employed for that purpose. Small embankments prevent the water from running on to other lands that may not at the time be in a condition to receive it; in fact, the processes of overflowing the lands, plowing, sowing, and harvesting are often being carried on simultaneously in adjoining fields.

When the land is sufficiently irrigated, the water is shut off, or the pumping discontinued. The process of irrigation is required to be repeated several times before the maturity of the crop, the quantity of the water depending very much upon the kind of product. Rice requires a large amount of water, and wheat, rye, and oats much less. There are in Egypt 8,406 miles of irrigating canals, of which 1,897 are navigable. There are also great dikes along the river and its various delta branches, to prevent their overflow, and innumerable small ditches and embankments everywhere throughout the country. In consequence of the muddiness of the waters of the Nile, the canals require frequent cleansing, and the high waters injure the dikes and render it necessary to repair them each year.

The greatest amount of labor is, however, that required in raising the water from the river and canals to the level of the lands. Dipping, drawing, and pumping are processes going on nearly the whole year, and nearly half of the whole irrigation is done by these means. Its water is raised from one or two feet to twenty, and sometimes more, according to the location of the land and the height of the river. The following is a description of the manner in which water is raised by means of the "shadoof." The "shadoof" is simply a leather basket-shaped bucket attached to a pole, suspended in the same manner as an ordinary well-sweep. The sweep is very short, and the bucket of water is balanced by a mud weight. The instrument is of the rudest character, but by this means water is raised to the height of eight or nine feet with considerable rapidity. If the water is to be raised twenty feet, one man close to the river raises it from four or five feet into a basin made of clay in the side of the bank, and from this point two men, each with a bucket, raise it about eight feet to a similar basin, and two others in the same manner to the required height, whence it is conducted by small earth sluices to the required place, often a considerable distance from the river.

It requires the constant working of these five "shadoofs" for forty-eight hours to water one "feddan" (equivalent to one acre). This, by changing once in four or six hours, would require ten men, each of whom would apply twenty-four hours' labor to the watering of one acre. This process requires repeating at least three times for each crop. Thus the labor required for the irrigation of one acre would be 720 hours, or seventy-two days of ten hours each. The labor is of the most severe kind, and the fellah, with nothing except a cloth round his loins, is compelled to apply himself to his task with all the energy at his command. In the delta, and some parts of Upper Egypt, the water being taken from the river at some distance above the point where it is used, is kept for a considerable portion of the year, on very nearly the same level as the land. If, however, it has to be raised at all, it requires at least fifteen days to the acre. When the water is raised only a few feet, the more ordinary method is that of the "sakia," a rude machine propelled by oxen, cows, and horses, and sometimes camels and donkeys, and which raises the water by means of earthen jars attached to an endless rope chain passing over a vertical wheel.

There are a few steam pumps, but fuel is too expensive, and labor too cheap to permit of their general use. The number employed is about 400, and these are mostly in Lower Egypt. They are used principally on large estates, but in some cases by those who irrigate the lands of the small farmers, at a fixed price per acre. This is generally where cotton is produced, which requires watering once in eight or ten days throughout the season. The water has ordinarily to be raised but a few feet, and the quantity required each time, when the watering is so frequent, is much less. The usual price paid per acre is about 30s., and it is only the low price of farm labor that renders it practicable to cultivate lands requiring so much irrigation.

Steamboat Boiler Inspection.

Section 4,433 of the Revised Statutes provides that "the working steam pressure allowable on boilers constructed of plates inspected as required by this title, when single-riveted shall not produce a strain to exceed one-sixth of the tensile strength of the iron or steel plates of which such boilers are constructed."

Compare with this plain provision of the law the following rule contained in the "General Rules and Regulations" prescribed by the Board of Supervising Inspectors of Steam-vessels, viz.:

"Multiply one sixth of the lowest tensile strength found stamped on any plate in the cylindrical shell by the thickness—expressed in inches or parts of an inch—of the thinnest plate in the same cylindrical shell, and divide by the radius or half diameter—also expressed in inches—and the sum will be the pressure allowable per square inch of surface for single-riveting."

This rule is supposed to be based on the law quoted above; but it is, in reality, in direct conflict with it; for, as the pressure allowed by this rule will produce a strain corresponding to one-sixth of the tensile strength of the metal in the *solid* parts of the plates, the strain on the metal between the rivet holes of the joints will be $\left(\frac{1}{6\times 0\,60}\right) = \frac{1}{3\cdot 6}$ of that tensile strength, since about 40 per cent of the metal is removed on the pitch line in punching the holes for a single-riveted joint.

In further illustration of the working of this rule we will take at random an example from the elaborate table giving the pressures allowable with cylindrical shells for different diameters, and for iron of different thickness and strength, which forms a part of the "Rules and Regulations." According to this table a cylindrical boiler having a diameter of 40 inches, and made of ⅜-inch plates, of iron having a tensile strength of 50,000 pounds per square inch, and with a single-riveted lap joint, is allowed a working pressure of 156·24 pounds per square inch. Using $\frac{11}{16}$ inch rivets, with 1⅞ inch pitch, for the single-riveted lap joint, the sectional area of the plate on the pitch line of the rivet holes will be 60 per cent of the area of an equal length of the solid plate. The strain produced in the least section of metal at the joint by the working pressure (156·24 pounds) would be $\frac{156\cdot 24\times 40}{2\times \frac{3}{8}\times 0\cdot 60} = 13{,}888$ pounds per square inch, instead of 8,333 pounds allowed by law.

But matters are still worse. The same rule provides, further, that in testing a boiler "the hydrostatic pressure applied must be in proportion of 150 pounds to the square inch to 100 pounds to the square inch of the steam pressure allowed." Consequently, in the above case, the test pressure will be 234 pounds, and the metal at the joint will experience a strain of 20,832 pounds per square inch; that is to say, the metal will be strained beyond the limit of elasticity in applying the test pressure.

Of course, no reputable boilermaker would build a boiler according to such rules; but the general public should fully understand that boiler inspection under such rules does not avert but invite danger.

C. R. ROELKER.

Salicylic Acid for Preserving Eggs.

Referring to a recent article in this paper on the preservation of eggs, our correspondent Mr. M. P. Baumann, of Pittsburg, Pa., gives the following method, which in his hands works to perfection.

Having filled a clean keg or barrel with fresh eggs, he covers the eggs with cold salicylic water. The eggs must be kept down by a few small boards floating on the water, and the whole covered with cloth to keep out dust.

If set in a cool place the eggs so packed will keep fresh for months, but they must be used as soon as they are taken out of the brine.

To make the salicylic solution, dissolve salicylic acid (which costs about $3.00 a pound) in boiling water, one tablespoonful of acid to the gallon. It is not necessary to boil all the water, as the acid will dissolve in a less quantity, and the rest may be added to the solution cold. The solution or brine should at no time come in contact with any metal. In a clean, airy cellar one brine is sufficient for three months or more, otherwise it should be renewed oftener. For that purpose the kegs, etc., should be provided with a wooden spigot to draw off the liquid and replenish the vessel.

Butter kneaded in the same solution, and packed tight in clean stone jars, will keep fresh the whole winter, but must be covered with muslin saturated in the water, renewing it sometimes. Cover the jars with blotting paper saturated with glycerine. Salicylic acid is harmless, and yet one of the best and certainly most pleasant disinfectants in existence, with no color, smell, or taste. The water is an excellent toothwash, and the best gargle to prevent diphtheritic contagion.

The Velocity of Light.

Preparations are nearly completed at the Case School of Applied Sciences, Cleveland, Ohio, for a reinvestigation of the velocity of light, by Professor A. A. Michelson, late of the Naval Academy at Annapolis. The methods and results of Mr. Michelson's measurements in 1879 were described at length in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 193.

The velocity found (186,380 miles a second) differed slightly from that obtained by M. Cornu at the observatory at Paris in 1874, and also, it is said, from that obtained more recently by Professor Newcomb at Washington. The results of the last named observations have not been published. Mr. Michelson has accordingly been requested to repeat his experiments; money for the purpose, about $1,200, having been promised from the Bache scientific fund.

The Cleveland *Leader* says that two small buildings have been erected for the experiments on the grounds of the Case School. The larger of the two, 16 x 45 feet, contains the chief apparatus. Two thousand feet west of it is a smaller building containing a stationary mirror. In the experiments the light traverses the space between the buildings and back again to the apparatus, by whose movement data are obtained upon which the velocity of the light is measured.

A Simple Method of Removing Sand Bars.

A press dispatch from Portland, Oregon, August 29, describes a promising device for keeping open the channel of the Columbia River, now seriously obstructed by sand bars. The promotor's theory was that the current was strong enough to carry off the sand if it were properly stirred up. Mr. Prescott, Manager of the Oregon Railway and Navigation Company, felt sufficient interest in the experiment to offer the use of the company's steam collier Walla Walla in making it. Under the supervision of Messrs. Gates & Holland, the mechanical engineers of the Oregon Railway and Navigation Company, the steamer was moored on the bar, bow up-stream, the stern at the lower edge of the bar, and loaded so that the keel touched the bottom. In eighteen hours' actual work a channel, 1,000 feet long and 100 feet wide, was deepened from a maximum of 18 feet to from 22 to 24 feet. The steamer is now completing and straightening the channel on the whole length of the bar, and after finishing at St. Helen's she will be sent to Walker's Island for similar work. Mr. Prescott speaks enthusiastically of the success of the experiment, which he regards as having solved the problem of keeping the river clear of obstructions and at a nominal cost.

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NEW COMBINATION CLUTCH.

It is, as its name indicates, a positive coupling for all kinds of shafts requiring connection while in motion, and no matter at what rate of speed the shaft may be running, the connection can be made without the slightest shock or jar, and we believe it is the only coupling combining the friction and positive clutch in one, enabling the operator to make a positive connection or not at pleasure, which is the great desideratum in "friction clutches," as the motion lost in the driven shaft of a manufactory, by depending on friction alone, would in a very short time pay for one of these couplings.

They are free from all rotating pins, bolts, levers, and unsightly projections that endanger the lives of the operators; they can clean and work around them while running with perfect impunity. The head of the key is covered with a leaden collar, and there is not a projection in the whole rotating parts of the device on which a thread would hang.

If it is desirable (as it is occasionally in some manufactories where there is danger of a block in the machinery) to use the friction alone, all that is necessary is to withdraw the clutch and adjust the friction cone to the work required, which can be done so nicely that a slight strain over its normal load will cause it to slip, thus often saving very valuable machinery from destruction.

It is well known among machinists that the old fashioned friction cone is the principal device used for driving by friction, but it is extremely liable to cutting or abrading of the two iron surfaces, which makes it very difficult to withdraw the cone sometimes.

In the clutch shown in the engraving, a foreign substance, such as wood, leather, paper, etc., is interposed between the surfaces, and this difficulty is overcome. The mode of applying it is very simple; any intelligent boy can readily take out the old filling and replace it with new in half an hour.

The method of applying the intermediate substance is by perforating the periphery of the cone, as shown in Fig. 1 and 2, corresponding in depth to the thickness of the filling material, which should stand a little above the surface, so as to keep the cone and drum slightly separated. Wads or pellets of tar millboard, a little thicker than the depth of the perforations, are punched out and driven home with one blow of a small hammer.

Millboard is preferable to any other material, being denser and more adhesive than either wood or leather, punches very smoothly, and lasts a long time.

Two forms of this coupling are made, one for heavy mill work that does not require to be coupled more than once or twice a day, as Figs. 1 and 3, and one for instantaneous coupling, as 2, 4, 5, 6, and 7, for steam winches, elevators, punching presses, shears, etc.

Fig. 1 is a front view of the device, with the parts open showing the filled perforations.

Fig. 2 is a sectional view showing the quick coupling apparatus and serrated clutch.

Fig. 3 is an end view showing the split collar, shifting arms, hand wheels, etc.

Figs. 4, 5, 6, and 7 are detail views of various parts of the clutch mechanism; Fig. 5 showing teeth on the face of the friction cone; and Figs. 6 and 7 being respectively face and side views of the toothed clutch.

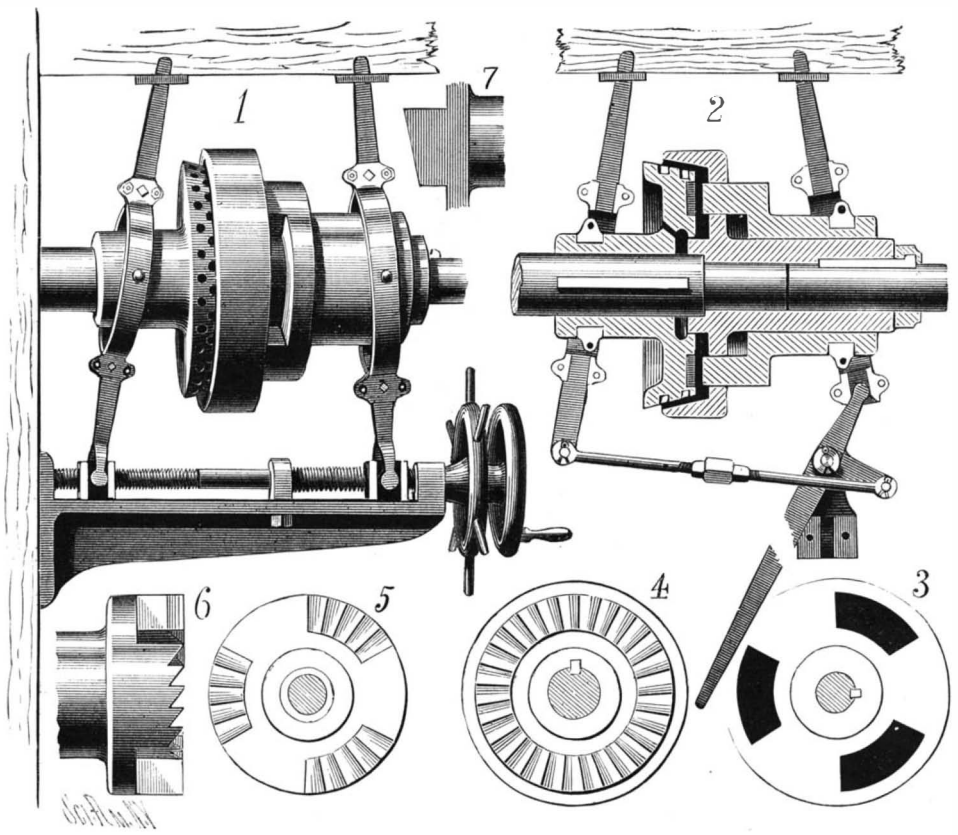
The clutch, as will be seen by the engraving, really comprises two systems, one the friction clutch as already described, the other a positive clutch, and these two forms of clutch, both having novel features, are arranged with mechanism for applying them, constructed so that the friction clutch may be applied first, and the positive clutch afterward.

The boss of each part of the clutch is grooved circumferentially to receive a split ring connected with the lever by which the two parts of the clutch are operated.

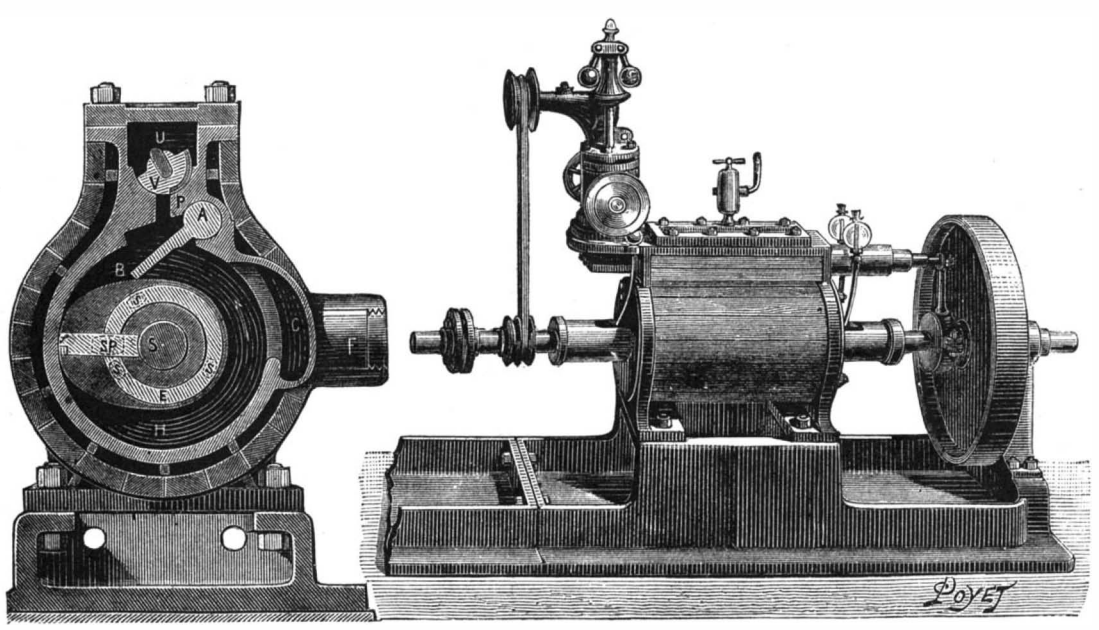
In the clutch shown in Fig. 1, the two parts are operated by screws, one screw passing through the other, which is tubular; both screws being provided with hand wheels by which to operate them. In the clutch shown in Fig. 2, the two parts are operated by means of a hand lever which works both parts by a single forward movement, the friction cone being first thrown into place and then the toothed clutch.

The operation of the clutch, shown in Fig. 1, is very simple. The hand-wheel is turned to the right, drawing the friction cone into the drum, giving the motion of the driving shaft to the driven shaft. The other hand-wheel is now turned to the left, forcing the lugs of clutch through the apertures of the drum against the face of the friction cone.

The friction is now released a little, allowing the friction cone to gain on the drum, until the long end of the lug enters the recess in the cone, and by the time the cone has gained on the drum the width of the lug, it has entered the recess the depth of the tooth, and abuts against the driving end of the recess in the face of the cone. It now only remains to force the clutch to its destination, and slacken the hand wheels enough to relieve the split collars and their grooves from friction. To uncouple the same, the operation is reversed. The clutch shown in Fig. 2 is operated by the motion of the lever, which has two short ends set at right angles; the short horizontal end is connected to the cone lever, by the connecting rod, which is adjusted by the right and left threaded sleeve, so that when the short end and connecting rod are on the center, the cone is tight enough to drive the drum, and in this position the perpendicular end of the lever has advanced so far that the teeth in the ends of the lugs, Fig. 7, are about to enter the teeth in the face of the cone. When the lever and connecting rod have passed the center, the cone is released enough to ease the split collars, and the same motion has advanced the vertical short end of lever so as to engage the toothed lugs with the serrations in the face of the friction cone. Further information may be obtained by addressing Mr. E. Wilkinson, 276 Ellison Street, Paterson, N. J.



WILKINSON'S POSITIVE COMBINATION CLUTCH.



HODSON'S HIGH SPEED ROTARY ENGINE.

American Beer Glasses in Germany.

In a recent communication from United States Vice-Consul Wm. Hummel, at Munich, the surprising fact is noted that a large proportion of the five millions of beer glasses used annually in Berlin are imported from America. Mr. Hummel thinks that it would be a good plan for American makers to establish agencies in other German cities, and expresses a willingness to forward, so far as he can, any efforts in that direction.

HODSON'S HIGH SPEED ROTARY ENGINE.

Rotary motors, which up to the present time had not given sufficient results to cause them to be adopted in the industries, seem to have come into some favor for a few years past. The causes of this are manifold; but, at all events, the great progress made for the last twenty years in mechanical construction, and the astounding development in the industrial applications of electricity, have, for the most part, contributed to the success that these machines now enjoy. Dynamo-electric machines require, in fact, of the motor which actuates them, qualities of a peculiar nature. They must be able to revolve with great speed and regularity, while at the same time possessing strength, simplicity, power, and lightness, and being of low price and costing little to run. Rotary motors exhibit in principle most of these qualities in a certain measure; for the direct action of steam upon the rotary piston gives at once lightness, high speed, simplicity, power, regularity, and economy as regards cost price. Economy in the expenditure of steam can be only obtained by the introduction of expansion, and this is what is accomplished in the already described Dolgorouki motor, and in the Hodson motor which we are now to make known.

This engine, of which the annexed cut gives a general view and transverse section, consists of a piston in the form of a cam, which revolves in a cavity of cylindrical form revolving around the axis, S. More accurately speaking, the motor consists of two distinct pistons fixed against one diaphragm in common, and keyed at 180 degrees from each other so as to insure of greater regularity; but it will be sufficient to consider only one of them. The axis of the rotary piston carries an eccentric which controls a slide valve, V, arranged in a cavity, U, through which arrives the steam under pressure, and which, through a backward and forward motion, regulates the admission of the latter and closes it at the instant at which expansion is to be effected. A B is a sort of valve which separates the cylinder into two parts, and which, at a given moment, enters a cavity made to receive it and allows the cam-shaped piston to pass. In revolving around A, the valve, A B, rests constantly against the piston; and the pressure of the steam insures of a hermetical joint in all positions. The eccentric is keyed upon the shaft in such a way that the valve, V, shall be open and allow the steam to enter at the moment at which the point, *f*, of the piston is at the upper part, and shall close the admission when the part, *f*, is at H. The steam inclosed within the space, B H (left half of the cylinder), expands, and then escapes at C, through the escape pipe, F. Expansion then occurs at half the travel. The function of the valve on the second piston is identical, but alternate with that of the first, so that one piston is always working at full pressure, while the second is operating by expansion. A fly wheel and a centrifugal ball governor, acting on the steam inlet, go to complete the motor. The machine actuated (be it dynamo-electric machine, circular saw, hydro-extractor, or otherwise) is fixed to the right or to the left on the prolongation of the shaft. The left end of the frame is squared off so that it and the frame of the driven machine may be solidly united by bolts and nuts in order to insure of an invariable position of the axes and to give more rigidity to the whole.

All parts of the machine submitted to friction are of phosphor bronze, and all the joints are kept tight by means of crowns and bands of the same material held against the stationary pieces by springs. These Hodson motors exhibit very great elasticity of power in causing a variation in the pressure of steam and in the speed, which latter may rise from 25 revolutions per minute up to 1,500 and even 2,000. So they are perfectly adapted for actuating dynamo-electric machines, as they communicate a proper speed to these without intermediate shafting and under the best conditions of simplicity and economy; and it will be especially in places where space is wanting that their advantages will be most appreciated.

At the Exhibition of Electricity at the London Crystal Palace, we saw several of these motors driving Brush, Gramme, and Siemens machines. Without in any way

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desiring to prejudge the importance of such applications, it was none the less interesting to remark how new needs may sometimes direct the researches of inventors toward old machines that were about condemned in the early history of the steam engine, but which, thanks to the progress in tools and to the application of science to industry, are to-day becoming practical.

Cold Winters.

The following statistics of the good old winters are curious: In 401, the Black Sea was entirely frozen over. In 768, not only the Black Sea, but the Straits of the Dardanelles, were frozen over; the snow in some places rose fifty feet high. In 822, the great rivers of Europe—the Danube, the Elbe, etc.—were so hard frozen as to bear heavy wagons for a month. In 860, the Adriatic was frozen. In 991, everything was frozen; the crops totally failed, and famine and pestilence closed the year. In 1067, the most of the travelers in Germany were frozen to death on the roads. In 1133, the Po was frozen from Cremona to the sea; the wine casks were burst, and even the trees split by the action of the frost with immense noise. In 1236, the Danube was frozen to the bottom, and remained long in that state. In 1316, the crops wholly failed in Germany; wheat, which some years before sold in England at six shillings the quarter, rose to two pounds. In 1339, the crops failed in Scotland, and such a famine ensued that the poor were reduced to feed on grass, and many perished miserably in the fields. The successive winters of 1432–33–34 were uncommonly severe. It once snowed forty days without interruption. In 1468, the wine distributed to the soldiers in Flanders was cut with hatchets. In 1684, the winter was excessively cold. Most of the hollies were killed. Coaches drove along the Thames, the ice of which was eleven inches thick. In 1709 occurred the cold winter. The frosts penetrated three yards into the ground. In 1716, booths were erected and fairs held on the Thames. In 1744 and 1745 the strongest ale in England, exposed to the air, was covered in less than fifteen minutes with ice an eighth of an inch thick. In 1809, and again in 1812, the winters were remarkably cold. In 1814 there was a fair on the frozen Thames.

PAPER-BAG HOLDER.

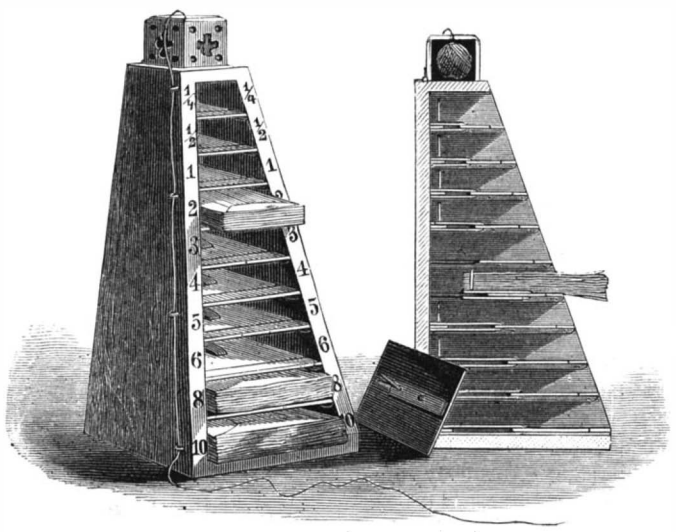
We give herewith perspective and sectional views of a very convenient holder for paper bags, recently patented by Mr. Richard M. Shaffer, of Cranberry, W. Va.

This device is for receiving and holding paper bags in assorted sizes in convenient position for easy access and removal. It is designed for the use of merchants and others who use paper bags for wrapping up merchandise.

The principal feature of the invention is the means for preventing the withdrawal of the bag adjacent to the one being pulled out whenever the bags tend to stick together. The bag holder is provided with a twine holder, making a convenient and compact device that can be placed almost anywhere on the counter without being in the way.

The back wall of the outer case is perpendicular, and the side walls and front incline inwardly at the top. The case contains a series of horizontal shelves, which constantly diminish in size from the bottom to the top, forming compartments for the bags. The compartments are marked with the size of bags which they are designed to contain. The shelves are made detachable, and rest upon cleats or guides on the side walls, and each shelf is provided, near its back end, with an upwardly-pointing pin, while the front end rests against a strip which forms a stop to hold the shelf in and prevent it from being pulled out when the bags are withdrawn. The pins pierce the edges of the bags near their mouths and hold the bags in place, so that only the bag which is taken in the fingers is removed, the others being held by the pin. As each bag is pulled out it is torn loose from the pin. To accommodate bags of different lengths the pins are mounted upon a sliding base, which moves in a slot in the back portion of each shelf.

Further information in regard to this useful invention may be obtained by addressing the inventor as above.



SHAFFER'S PAPER-BAG HOLDER.

IMPROVEMENT IN RAZORS.

The engraving shows a razor of new design, recently patented by Mr. W. H. De Pew, of New York city. The invention consists specially in the shape or configuration of the shank or handle of the blade, which is made in the form of a reverse curve or in the form of an elongated S. The curve or bend next to the heel of the blade extends above the back of the blade, so as to increase the depth of the thumb rest. The reverse curve extends to the end of the shank of the handle. This is a marked improvement on the old-fashioned razor, making it a really scientific instrument, much better adapted to its use than any of its predecessors.

The tang is of unusual length, and is attached to a perfectly formed blade of new design. It is pivoted with the handle in such manner as to give the whole a perfect balance in the hand, and gives a complete control of the razor and a firm and steady grasp. This renders shaving easy without slip or fatigue. Further information in regard to this useful invention may be obtained by addressing Mr. W. H. De Pew, P. O. Box 3018, New York city.

DE PEW'S IMPROVED RAZOR.

Professor Esmarch on the Case of President Garfield.

Professor Esmarch delivered a lecture on the treatment of President Garfield's wound before the Physiological Society of Kiel, in February last. This lecture he has now printed and circulated, and it is impossible that the views of a surgeon so accomplished and so worthy of expressing an opinion on such a case should not be canvassed. The facts of the case are first of all clearly and fairly stated from Dr. Bliss's own published accounts of the progress of the case and of the *post mortem* examination. Professor Esmarch's conclusions are: (1) that the wound was not in itself absolutely fatal; (2) that the bullet was not the cause of the septic suppuration in the wound which led to the fatal result; (3) that the cause of the septic suppuration was introduced from without, and that as contributing directly or indirectly to this were the following errors in the treatment: the repeated probing and examination of the wound with instruments and fingers not rendered aseptic, the failure to dress the wound aseptically, the syringing out of the wound with fluids not sufficiently antiseptic, and the failure to give a complete vent to the "bagging" pus; (4) there was no true pyæmia, but only metastatic inflammation of the parotid gland; (5) the cause of death was hemorrhage, moderate in amount, but occurring in one whose strength was undermined by septic fever, decubitus, bronchial catarrh, and hypostatic pneumonia; (6) although the splenic artery may have been injured primarily by the bullet, or by a splinter of bone, this would not have led to the formation of a false aneurism, except for the establishment of putrid suppuration.

In conclusion, Professor Esmarch refers to the popular superstition that the bullet is the cause of all danger in a gunshot wound, and that to extract the bullet should be the chief aim of the surgeon. He asserts that most of the secondary dangers arise rather from the fingers of those who explore the wound, and that the American surgeons committed the error of doing too much rather than of doing too little, as they have been freely accused of at home. Finally, he surmises that if no search had been made for the ball, and the wound had been dressed aseptically, the unfortunate patient would have been alive now.

Valuable as is Professor Esmarch's opinion on such a point, we regret that this lecture has been published, at any rate so soon. It would not have lost in value by being kept back until the acrimonious discussions of the conduct of the attending surgeons had died out on the other side of the Atlantic. It is proverbially easy to be wise after the event, and it is an ungracious task to criticise adversely the conduct of men who, under very trying circumstances, were suddenly called upon to act in a grave emergency. We are willing to admit that mistakes may have been committed, but it is a case in which the golden rule is eminently applicable: "Let him that is without sin first cast a stone."—*Lancet.*

Dangers of Steam Street Pipes.

An illustration of the possible dangers of the system of public steam supply which is now rapidly coming into vogue, is furnished by a recent accident at Lynn, Mass. In that town steam has been supplied for some time to customers by means of pipes laid in the streets, and on a recent Monday morning one of the street mains blew up with a loud explosion, hurling stones and gravel in every direction to a distance of forty or fifty feet. Nearly every window was broken in the neighboring buildings, and some of these received other injuries, while a woman who happened to be passing by was seriously hurt. The accident is explained by the daily papers, in their usual satisfactory manner, as having been due "to accumulation of water in the pipes." It seems that this is the third explosion of the same kind which has taken place in Lynn within two weeks. After the first one an engineer was discharged on the ground that his carelessness in "allowing water to stand in the pipes" had caused the accident, but he appears to deny his guilt, and says that "the system of pipe-laying is not correct."

If we were not afraid, says the *American Architect,* of hurting the feelings of the stockholders of the Citizens' Steam Company, we should say that both these explanations were simply ridiculous, and that the obvious cause of the explosion was the inability of the pipes to resist the strain upon them. Whose fault this may have been we do not care to inquire, but we may suggest that it would not be very difficult to ascertain in case of need. Meanwhile, we trust that the engineers of the new steam heating companies in other cities are laying pipes which they are sure will not burst out of resentment at being improperly laid, or because of water being allowed to stand in them. An explosion in Broadway, for instance, would be a serious matter, even if it amounted only to the hurling of a few hundred paving stones over the passers-by, and through the plate glass show windows which line the street.

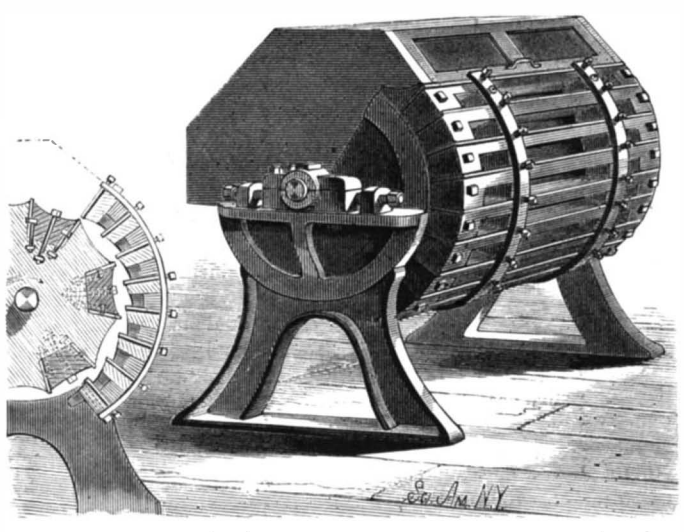
NEW COTTON SEED HULLER.

We give an engraving of a new cotton seed huller recently patented by Mr. Hugh S. Walsh, of Argenta, Kansas. This machine is provided with adjustable knives in the concave, and with a series of knives placed in the cylinder which revolves in close proximity to the concave, as shown in the sectional view.

The revolving cylinder is fluted longitudinally, and every other concave or flute is a removable segment held in place by screws. To compensate for the wear of the knives on the cylinder, screws are provided in the bottoms of the sockets in which they are placed, so that by removing one of the segments between the knives the latter may set out.

At the top of the machine there is a hopper for receiving the cotton seed. When the machine is revolved in the proper direction, the seeds being carried by the concave flutes of the cylinder into the space between the cylinder and the inclosing case, the knives rapidly remove the hulls.

This machine is easily operated and very readily adjusted. This machine has a great capacity, and does its work thoroughly. The daily increasing use to which cotton seed and cotton seed oil are applied give value to a practical machine of this kind.



WALSH'S MACHINE FOR HULLING COTTON SEEDS.

A Floating Telephone Station.

Experiments have been made at Havre, France, to test a system of telephony between the Roads and the city. They have been so successful that it has been proposed to form a pontoon structure at a distance from the land, on board of which public telephones should be placed for use by the shipping in communicating with the land.

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

BY H. C. HOVEY.

Twenty-five years ago this scientific body met in Montreal, where it now has met again. Of the members who were present at the former meeting only three remain. The city that then had but 50,000 inhabitants now has 150,000. The American Association for the Advancement of Science was originated in Philadelphia in 1848, but held no meetings from 1860 to 1866 on account of the war, which explains the fact that this is but the thirty-first annual meeting.

The opening ceremonies this year, August 21, were quite impressive. After the new President, Dr. J. W. Dawson, had taken the chair, prayer was offered by his Lordship the Bishop of Montreal. Addresses were made by the Mayor of the city, wearing the "collar of office;" by Dr. T. Sterry Hunt, Dr. Thorburn, of Ottawa, and others. It had been hoped that the Marquis of Lorne might have been present, but he was prevented.

The attendance was unusually large. The list of scientific papers entered was 256, most of which received attention. The custom is allowed, however, of letting favorite speakers run over the time allotted to them, thus crowding out others having an equal claim to be heard. For instance, one paper, to which fifteen minutes were assigned in the programme, occupied, with very rapid delivery, fifty-five minutes, not including subsequent discussion. This member must have known that his paper could not be read in fifteen minutes. I should add that in this instance the contribution was valuable and worth hearing throughout. But in most cases the quality would be improved by condensation, and papers should not greatly exceed the time indicated on the programme.

The American Association for the Advancement of Science is divided into nine sections for the special consideration of as many branches of science as possible, and these sections meet separately after the general sessions. A great amount of work is thus accomplished; and while, perhaps, some of the papers read are crude or visionary, the majority are the fruit of long toil and wide research.

The first place, among addresses before the whole body, belongs to the address of the retiring President, Prof. G. J. Brush, of Yale College. It was delivered in Queen's Hall, which was crowded with hearers. The subject, "The Progress of American Mineralogy," led the speaker over an extended range of observation. The main points were as follows. The distinct beginning of the science was in an association, formed in 1798 in New York City, as the "American Mineralogical Society." Only two minerals new to science had before this been found here, namely, labradorite and strontia. The study of mineralogy was carried on by aid of European collections. Four men were especial leaders in active search for minerals peculiar to American rocks. Dr. Archibald Bruce founded, in 1810, the *American Mineralogical Journal*, and described in it the first discoveries made in this country, and described by an American, namely, the *native magnesia* of Hoboken, and the *red zinc* oxide of Sussex Co., N. J. In 1805, Col. George Gibbs, of Rhode Island, brought back with him from Europe the most valuable collection of minerals ever brought to this country. He then devoted his great wealth to extensive journeys and unselfish research to unfold the resources of his native land, generously aiding others in the same direction. Another was Prof. Parker Cleaveland, whose treatise on Mineralogy and Geology (1816) met a pressing need, felt by all classes of students, for a distinctly American text-book. The fourth name was that of Prof. Benj. Silliman, who raised the funds to purchase the splendid cabinet of Col. Gibbs, which has probably done more to stimulate research and create an interest in mineralogy than any other one agency. This was added to minor collections previously made in his travels in this country and in Europe. Silliman also established, in 1818, the *American Journal of Science*, to which he furnished many original contributions. For more than fifty years he was a professor in Yale College; and when he resigned he was happy in having Prof. J. D. Dana as his successor, who had already made himself eminent as a mineralogist.

Prof. Brush traced the results of the work done by these pioneers, whose individual enthusiasm and enterprise really upheld the science, to which they were devoted, during the first twenty-five years of this century. Besides the four men to whom pre-eminence was given, others were named, whose long journeys on horseback, by canal-boats, and in other primitive ways in the interests of science, were such as to command our admiration. The public mind at length caught their enthusiasm, and government came to the aid of science. The first State Geological Survey was made by North Carolina, in 1824: the example was followed in 1830, by Massachusetts, and then by other States, until now the whole territory of the United States and Canada either has been, or is being, surveyed. It cannot be attempted, however, to follow the admirable sketch of work now being done by living mineralogists, nor to reproduce the highly suggestive remarks on the relation of this science to chemistry and kindred sciences. Evidently a broader foundation is now needed for it than in earlier days, and there must be co-operation between special investigators. There is an interdependence between mineralogy, geology, chemistry, and physics, such as warrants the continued existence of an association that shall make sure that every new fact and law observed shall be used for the common advancement of all the sciences.

The Vice Presidents of the several Sections opened work in their respective rooms by addresses. In Section A, (Astronomy and Mathemathics) the subject of the opening address by Mr. Harkness was "The Transits of Venus." In Section B (Physics), Prof. Mendenhall spoke on "Methods of Teaching Physical Laws." In Section C (Chemistry), the address by Dr. H. C. Bolton reviewed the history of chemical literature. In Section D (Mechanical Science), Prof. Trowbridge spoke on the "Importance of Experimental Research" in this era of applied science. Prof. E. T. Cox laid before Section E (Geography and Geology) some results of his observations along the Pacific slope. Prof. W. H. Dall reviewed the progress of American conchology, in Section F (Biology). Section H (Anthropology) was opened by an address by Prof. Daniel Wilson, read by Prof. Otis T. Mason, on the "Physical Characteristics of Native Tribes of Canada." Section I—a new section of Economic Science and Statistics—was opened by an address by Mr. Elliott, chiefly devoted to explaining the special scope and province of Economic Science. All these addresses were of a most interesting character.

It would be gratifying to give a full account of all the papers read in the various sections from day to day; but, considering that there were about 250 of them in all, it cannot be expected that they should even be given in a condensed form. The very list of titles is formidable to the eye and one wonders how even the devotees of science can be induced to listen to so much learning in the sultry days of August. The attendance, however, was good in every room, from first to last, and the interest did not seem to flag.

Recognizing the fact that another might mention other articles of equal merit with those that attracted the writer's notice, I may mention a few of the noteworthy contributions, without specifying in each case the section before which it was laid.

An important paper was read in the section of Mechanical Science, by Mr. Joseph L'Etoile, of Ottawa, on "Atmospheric Currents, Electricity, and Gases, as related to Practical Aerial Navigation by Balloons." He held that such navigation of the air is perfectly feasible, but that many improvements in balloons are needed as to their form and general construction; some of these he pointed out. He proposed that the balloon should take the shape of a fish, and be provided with a propeller, a rudder, an air compartment, gas and air pumps, electric battery, electric motor, safety valve, ropes, and ballast. Each improvement was particularly described, and it was shown that the balloonist might have a vehicle as safe and controllable as any other machine, with certain advantages of a remarkable nature.

Prof. W. A. Rodgers offered a communication concerning the problem of "Fine Rulings, with reference to the Limit of Naked Eye Visibility and Microscopic Resolution." The finest lines ever reached are those of Nobert's bands, namely, 113,000 to the inch. No one has been able to go with certainty beyond this limit, although Mr. Fasoldt, of Albany, claims to have ruled one million lines to the inch. Conceding this to have been done, it is not conclusive as to their visibility. In the discussion that followed it was shown that when ruled lines are filled with graphite, and the surface covered with a film of moisture, they become for a moment easily visible, even though their width is but one one hundred-thousandth part of an inch.

Prof. C. A. Young gave a description of the new twenty-three-inch equatorial recently erected in the Halsted Observatory, at Princeton, N. J., and which is regarded as the most nearly perfect telescope in this country, if not in the world.

A singular discussion arose in consequence of a paper read by Prof. De Volson Wood, of Hoboken, on "A Correction in Newton's 'Principia' in regard to the Time of the Approach of Two Spheres." Newton says that if two spheres of the same material as the earth, and each one foot in diameter, be placed 12½ inches from each other between their centers, in void space, they will be a month's time in coming together by their mutual attractions; whereas the experiments of Prof. Wood showed the time required to be less than 5½ minutes. Dr. Haughton at once challenged the quotation, saying that it was incredible that so accurate a writer as Sir Isaac Newton should have fallen into such an error. A spirited discussion followed, that led to the production of the Jesuits' edition of the famous Principia, with numerous foot-notes. Dr. Haughton claimed that the second volume, from which Prof. Wood had quoted, while a great literary curiosity, was not genuine, because it referred to matters that were unknown in Newton's time. Prof. Wood, in defense, asserted that the error he had corrected was found also in the larger edition of Newton's works, page 527, in his "Treatise of the System of the World," and he took it for granted that it was genuine.

Dr. Haughton read a paper on "Darwin's Theory of the Evolution of the Earth-Moon System, in its Bearing on the Duration of Geological Time." Concurring in Darwin's published calculations, he differed from his physical conceptions. The eighteenth century astronomers believed in the perpetual motion of the planetary system, but now we know that perpetual motion is as impossible among planetary bodies as it is at the surface of the earth. It used to be held that the planets passed through a liquid to a solid condition, and that the earth now consists of a solid crust resting on a fluid mass. But Sir Wm. Thomson has proved that the present condition of the earth, as a whole, is more rigid than glass or steel. From the most probable hypothesis as to the rings of Saturn being composed of discrete meteoric stones; from the low specific gravity of Jupiter and other outer planets; from recent researches as to meteoric showers and comets; and from investigations into the true nature of asteroids, as well as from other considerations, it is probable that when the earth and moon separated from the solar nebula, they did so as a swarm of solid meteoric stones, each having the temperature of interstellar space, *i. e.*, about 460° F. below the freezing point of water. The earth and moon were pushed apart by tidal friction; and the algebraic calculations by which this may be proved fit equally well the hypothesis of a viscous earth or that of a rigid earth with a liquid ocean. Sir William Hamilton's theory, that one hundred million years ago the earth was as hot as melted steel, differs greatly from Dr. Haughton's theory that its component particles were intensely cold, and that volcanoes were but as pustules on the surface. His paper was discussed by Profs. Chase, Young, and others, eliciting much interest.

Dr. George F. Barker's observations on secondary batteries, in which he directed attention to the cheapest possible method of producing electricity for the purpose of illumination, were regarded as having a practical bearing of very great value, and explained the way of facilitating the reversal of electro-motive power in secondary batteries at a minimum of cost.

Prof. W. H. Brewer drew attention in a paper on the "Apparent Size of Magnified Objects," to a series of experiments he had made with many persons as to the relative size of objects as seen by the microscope and the naked eye. A magnified image having a theoretical value of 4·66 inches, appeared to one observer to be six inches, to another twelve inches, and to another (an experienced draughtsman), *five* feet in length. The practical conclusion was that, while much depended on a healthy condition of the eye, much was attainable by education, it being evident that an eye educated to use the microscope would be less liable to error than one that had never been trained.

Mr. W. Le Conte Stevens, who has made the subject of stereoscopy a study, read a paper describing the results attained by the use of the electric spark in binocular vision. When the relation between the visual lines was such as to imply no unusual muscular strain, it was found possible to interpret the binocular retinal image by the aid of a single spark.

Prof. A. Graham Bell's paper on a newly devised apparatus for the detection of bullets in wounds was listened to with especial interest, on account of its failure to show the true location of the ball lodged in the body of the late President Garfield. Prof. Bell explained his improvements, by which he was confident of more exact results on any future occasion of a similar nature.

In the section of Geography and Geology, highly important papers were read on a variety of interesting topics; some of which will be noticed further on.

Prominent among foreign visitors present was the celebrated Dr. W. B. Carpenter, who delivered an interesting address in Queen's Hall, on the "Temperature of the Deep Sea." He stated that previous to his own investigations due allowance had not been made for the enormous pressure on the bulbs of thermometers at great depths, by which the mercury would be forced up into the tubes and record fallacious indications. His experiments led to the construction of the Miller-Casella thermometer, capable of bearing a pressure of five tons to the square inch, without affecting the temperature recorded. With this improved instrument his deep sea observations were made. The generally received impression had been that the sea had a universal temperature below a certain depth, of 39 degrees Fahr. But Dr. Carpenter found the temperature of the deep basin of the North Atlantic to be 35 degrees, while in the Färöe Channel, within a hundred miles of Scotland, it fell to 29½ degrees. This proved that, in the Färonese Channel, there was a tongue of the Arctic current. In the Mediterranean Sea, while the surface temperature was 60 degrees, the great mass of water below, down to the depth of 2,500 fathoms, was unvaryingly 55 degrees. The reason of this temperature, 20 degrees higher than the mass of the Atlantic, was found in the fact that the Mediterranean was walled off by a ridge at the Straits of Gibraltar, by which the colder currents were shut off. A similar phenomenon was presented in certain partly inclosed seas in the Pacific Ocean. The Polar currents, however, swept without interruption through the great body of oceanic waters, obeying laws that could be easily demonstrated in the lecture-room, by applying a block of ice at one end of a tank, and a plate of hot iron at the other, the currents being indicated by coloring the water. The Arctic and Antarctic underflows meet and rise almost to the surface near the Equator in a very cold current, so that, while the surface may have a temperature of 78 degrees, it falls to 35 degrees only about 300 feet below. Receding from the Equator this submarine temperature gradually rises, as the cold currents fall again toward the bottom of the sea.

In connection with this play of currents, Dr. Carpenter explained the Gulf Stream, which carries into the mid-Atlantic an enormous body of warm water, not losing its velocity till it encounters the polar currents. The venerable physicist occasionally relieved the severity of his learning by bits of pleasantry that were very well relished by the hearers; as for instance, when he expressed apprehension that some ingenious Yankee might divert the Gulf Stream by cutting through the Isthmus of Panama, by which pro

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cess Great Britain might possibly be rendered a howling wilderness. We were implored not thus to bring ruin on the British Isles.

One of the most thoroughly discussed papers presented before the Geological Section was that by Professor Carril Lewis, on "The Terminal Moraine across Pennsylvania." The southern limit of the great ice sheet that once wrapped a large part of North America is marked by a terminal moraine. It is claimed that this deposit has been traced from Cape Cod, where it begins, across Rhode Island, Long Island, and New Jersey, into New York State. It has also been traced across Ohio, Indiana, Illinois, Wisconsin, Minnesota, and Dakota, to the Saskatchewan region of the Dominion. Professor Lewis claims to have filled the gap in this long chain by his discoveries in Pennsylvania. He traced the moraine for 400 miles, across the great divide between the Atlantic and the Gulf of Mexico, where it exists at the height of 2,480 feet above the sea. Where it enters the State of Ohio it has descended to the height of 800 feet above the sea level. The line between the areas of glacial action and those where the ice had not been were so sharply defined that you could stand with one foot on the striated rock and the other on rock that had not been glaciated. All along this line of demarkation were found crystalline bowlders and masses of labradorite that must have come down from the Adirondacks and highlands of Ontario. Dr. Dawson and several other geologists of note took part in the discussion of this important paper.

Prof. F. W. Putnam read papers in the Anthropological Section on "The Exploration of Mounds in Ohio and Tennessee," in which flints were found, as well as fragments of pottery and numerous animal remains. The remains of a log cabin had also been discovered belonging to the "Stone Grave Period" in Tennessee. The first indication of the building was a piece of charcoal found in digging. This led to the unearthing of a mass of charcoal so fresh as to be plainly the remains of some burnt building. The clay between the logs was well preserved, and even the marks of fingers could still be seen. The antiquity of the structure was shown by the fragments of pottery found amid the ashes.

Prof. Putnam also read a paper to show that copper implements and ornaments had been in use from the beginning of the so-called Neolithic Period. None of these were cast, but all were hammered out from pieces of native copper. Mr. R. P. Hoy held that the Mound-builders were the immediate ancestors of our modern Indians. Some of the mounds are of very recent date, as is evinced by the brass kettles, iron tomahawks, beads, and other modern articles found in them.

A valuable paper, read by Mr. Horatio Hale, traced Indian migration by linguistic peculiarities. Curious resemblances between the Indian and the Basque languages lead to the conclusion that the ancestors of our Indian tribes were emigrants from Europe. It is also probable, as Mr. Hale thinks, that the inhabitants of modern Europe are people of a mixed race, forming a transition in mental and physical traits between the eastern Aryans and the aboriginal Americans.

Among the most entertaining papers read before Section H were those presented by Mrs. Erminie Smith and Miss Alice Fletcher, who have for a long time actually lived among the Indians and been adopted into their tribes, in order to gain information as to their home-life, manners and customs, beliefs and superstitions, and any other peculiarities of interest to science.

Among the concluding papers in Section E was one by the writer on "Subterranean Map Making," particularly with reference to American caverns. A map of Mammoth Cave, Kentucky, was exhibited, being the completion of the diagram only partially shown at the Cincinnati meeting last year, and also a new map of Luray Cave, Virginia, made from a careful survey by the proprietors last winter. This was followed by a paper on the "Caves of Staffa and their Relation to the Ancient Civilization of Iona," by Mr. F. C. Whitehouse, of New York, who advanced the original idea that Fingal's Cave, and other grottoes in its vicinity, were artificial productions, instead of being caused by erosion. While there was a difference of opinion as to the validity of Mr. Whitehouse's conclusions, all who heard him were interested in the explanations he offered, and regret was expressed that more time might not have been allowed for the discussion of his novel views of this famous locality.

Minneapolis was chosen as the place for the next meeting. Prof. C. A. Young, of Princeton, was elected President, and the following were elected as Vice-Presidents: W. A. Rogers, H. A. Rowland, E. W. Morley, DeVolson Wood, C. H. Hitchcock, W. J. Beale, J. D. Cox, O. T. Mason, and F. B. Hough. The general Secretary is J. R. Eastman, with Alfred Springer as assistant. Treasurer, William Lilly.

In general the Montreal meeting, which came to an end August 30, may be regarded as one of the most interesting and successful ever held by the American Association for the Advancement of Science The number registered as in attendance was 937, of whom 324 were new members. The citizens took an interest in the public meetings, though hardly to so great a degree as they did at Boston and Cincinnati. The social element was, however, unusually prominent, and added much to the pleasure of the occasion, without really interfering with graver matters of scientific research. President Dawson give his reception on the occasion of the formal opening of the new Peter Redpath Museum. As the closing feature of this entertainment there was an exhibition of a large number of fine magic lantern views of cave scenery, which had been put at the disposal of your correspondent for that purpose by the managers of the Mammoth and Luray Caves.

A word may be added as to the special displays of minerals and fossils, which is rather less than in former years. Prof. Ward has some remarkable novelties from his recent visit to New Zealand, the most noteworthy being a case of brilliant bird-skins, some of which are extremely rare; also some peculiarly fine glass sponges.

Prof. D. A. Bassett has on exhibition, in an adjoining room, a collection of carboniferous crinoids from Crawfordsville, Ind. The specimens are very perfect, and the skill shown in working them out is unusual, leaving them in bass relief on the native limestone in which they were found. Groups of crinoids are thus seen on single blocks. One slab, about three feet square, contains eighty crinoids still lying in their original position as petrified. Other blocks contain ten or twenty each, the ornate heads and long, slender stems intertwined. These beautiful specimens were not on sale, but were exhibited as objects of scientific interest.

The local Committee, of which Dr. T. Sterry Hunt was chairman, managed their multiform duties with skill and efficiency. Mention should especially be made of the various delightful excursions that were planned to Quebec, Ottawa, Lake Memphremagog, and also of the visit to the Montreal Harbor, the celebrated Victoria Bridge, and the shops of the Grand Trunk Railroad.

It was announced in the Montreal papers that the British Association for the Advancement of Science would meet there in 1884, and that the American Association would probably meet with them. While such an international meeting would be highly gratifying to many persons, it may be safely said, in view of the rules of those scientific bodies mentioned, that nothing definite has been determined, and that any announcement must be premature beyond the mere fact that the subject is under discussion.

Harmony Mills, Cohoes, N. Y.

A strike of eighteen weeks' duration was ended at the Harmony Mills, Cohoes, August 28. The strike began April 24. The following figures give an idea of the forces in conflict, the losses suffered, and the results:

The number of employes, including every grade, is nearly 4,000, and the pay-roll every four weeks will average $70,000. The weavers are the most important, and of the laborers they number 1,200, and operate five looms each. Their daily wages will average $1.10, and their total loss during the "stayout" reaches $116,000, besides $12,000 to overseers and section hands. There are 113 pairs of mules, and the loss to the overseers, mule-spinners, and spinning-room hands amounts to $34,940. In the carding-rooms there are 560 employed, on whom a loss in wages of $44,000 is entailed. The spinning department is operated by children, and their addition to the general loss will exceed $25,200. Spoolers and warpers would have earned $18,000, and the dressers and all other departments, including laborers, would have been credited with $16,500. The total loss in wages amounts to $267,240. These figures are under the ten per cent reduction. In round figures the strike has cost $270,000. On the day the mills shut down there were 380,000 pieces of cloth in the market at Fall River, which were selling at 3⅞ cents a yard. One week ago the stock on hand at that point had been increased 350,000 pieces, and the price had declined, while cotton was 1⅜ cents a pound higher. It is estimated that, at the present state of the market, a net gain to the Harmony Mills of $65,000 has been made, which more than balances the loss by the stoppage. The operatives are in arrears $15,000 for rent, and thousands of dollars for provisions, clothes, and other necessaries. The Harmony Mills suffer a direct loss of taxes, insurance, and water power amounting to $45,000. The production is 6,500,000 yards, or 120,000 pieces, every four weeks.

The Harmony Mills are six in number and of the following dimensions: No. 1, four stories, 550 feet long, 70 feet wide; No. 2, three stories, 600 feet long, 75 feet wide; No. 3, five stories, and including the extension 1,185 feet long, 70 feet wide, with a wing 125 x 56 feet and five stories high; No. 4, five stories, 200 feet long, 50 feet wide; No. 5, five stories, 500 feet long, 50 feet wide; No. 6, known as the "Ogden Mills," four stories, 500 feet long, 50 feet wide.

Mr. John Pender and Submarine Telegraphy.

Mr. John Pender, M.P., one of the earliest promoters of ocean telegraphy and now controller of a large part of the world's cable systems, arrived in this city August 30. Mr. Pender has been directly interested in the laying of almost every important ocean cable throughout the world. Describing the combined cable systems under his direction, he said:

"We have outside of the eight Atlantic cables a through system direct to India, touching at the following points: It proceeds from Porthcurno, in Cornwall, to Vigo, Lisbon, Gibraltar, Malta, Alexandria, Suez, Aden, Bombay. A duplicate cable system starts from Marseilles across to Algiers, and thence to Malta and Alexandria. A further system connects the whole of the Greek Islands with the Levant, Constantinople, Cypress, and Odessa. Another line starts from Madras, goes to Rangoon in one direction, and thence to Penang. A duplicate line also starts from Madras, goes to Penang, Malacca, and Singapore. From Singapore one of the main systems proceeds to Saigon, Cochin China, and Hong Kong, connecting the latter place with a system in connection with Shanghai and Japan. There is also a cable from Hong Kong to Manila. The second main system proceeds from Singapore to Australia, touching at Java on the way, and connects Australia with New Zealand. Another system proceeds from Aden to the Cape of Good Hope, touching *en route* at Zanzibar, Mozambique, Delagoa Bay, Durban, and the Cape. Our system in the Brazils connects that country with Europe. These cables are submerged in depths varying from a few fathoms to nearly three miles. On one occasion a message was sent from London to San Francisco in less than two minutes."

How to Cool an Apartment.

A simple way of cooling the air of a room is described in the New Orleans *Picayune* of a recent date. The composing room of the *Picayune* is situated in the upper story of its publication house, just under the roof, and in summer is extremely hot. This season an inspiration seems to have come to one of the oppressed occupants, and in accordance with it a vertical wooden box was constructed in the corner of the room, with openings at the floor and ceiling, and furnished with a pipe for supplying water at the top, and a pan and drain at the bottom for receiving the flow and carrying it safely away. The supply pipe was bent over the upper end of the shaft, and fitted with a rose like that of a watering pot, so as to deliver a shower of spray instead of a solid stream. On connecting it with the service pipe, the movement of the water was found to cause an active circulation of the air in that part of the room, which was drawn in at the upper opening of the shaft and issued again, cool and fresh, at the floor level. The most surprising thing about the experiment seems to have been the effect of the water in cooling the air to a degree much below its own temperature. With Mississippi water, which when drawn from the service pipe indicated a temperature of 84°, the air of the room, in which the thermometer at the beginning of the trial stood at 96°, was cooled in passing through the length of the shaft to 74°, or about 20° below the temperature at which it entered, and 10° below that of the water which was used to cool it. Of course the absorption of heat by the evaporation of a portion of the water accounts for its refrigerating effect, but the result seems to have been so easily and inexpensively attained that the experiment would be well worth repeating in other cases.

Notable Characteristics of American Minerals.

In his address as retiring president of the American Association Professor Brush mentioned several notable characteristics of American minerals, among them the grand scale upon which crystallization has taken place—common mica in sheets a yard across, feldspar where a single cleavage plane measured ten feet, prisms of beryl four feet long—and so in general much larger crystals than those obtained from European localities. Another noteworthy fact is the occurrence, in abundance, of some of the rarer elements as constituents of the minerals found.

For example, among the rare earths, glucina, zirconia, etc., lithium occurs in our lithia micas, and spodumene, containing from five to eight per cent of lithia, occurs by the ton in at least one locality. Among rare metals which form metallic acids, columbium, the first metal new to science discovered in America, is found from Maine to Georgia. Many other examples were given, including the rare metal tellurium, which is found in Colorado in one locality, where masses of twenty-five pounds have been taken out. Yet only a small portion of the United States has been thoroughly explored, and we are far behind Europe in the variety of minerals obtained from our mines. The careful inspection of quarries and mines is much to be desired, rich sources for minerals, where valuable material is in danger of being buried out of sight. If our trained mineralogists would oftener go into the field, and if our wealthy amateurs would aid in exploring the American localities as freely as they engage in importing costly specimens from Europe, they would do much to foster science.

Improvements at Red House Observatory.

Mr. William R. Brooks has just mounted at his private observatory—Red House Observatory, Phelps, N. Y.—a new reflecting telescope of 9¼ inches aperture, of his own construction. It is made on the Newtonian principle, and of short focus. It is designed mainly for comet seeking, a branch of astronomical work to which Mr. Brooks is devoting special attention. The telescope is mounted as an alt-azimuth instrument. The light-grasping and defining powers of the telescope are excellent. Six eyepieces belong to the instrument, giving a large range of magnifying powers. The comet eyepiece is a positive, giving a clear field of 1½ degrees and a power of 30 diameters.

Storm and Freshet Signals.

Our correspondent, "F. G. S.," suggests that life and property might be saved in the northwest by a system of gun signals warning people of the approach of hurricanes, floods, and the like. The direction and degree of the danger might be indicated by the number or rapidity of the discharges. This, of course, in sparse communities and in regions unprovided with telegraphs. Systems of gun signals might be agreed upon and operated profitably by settlements in river valleys subject to sudden overflow. It may be doubted whether gun reports would not be drowned by the roar and thunder of the severer tornadoes; and yet, supplemented with telegraphs, they might prove very useful.

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IMPROVED AGRICULTURAL ENGINE.

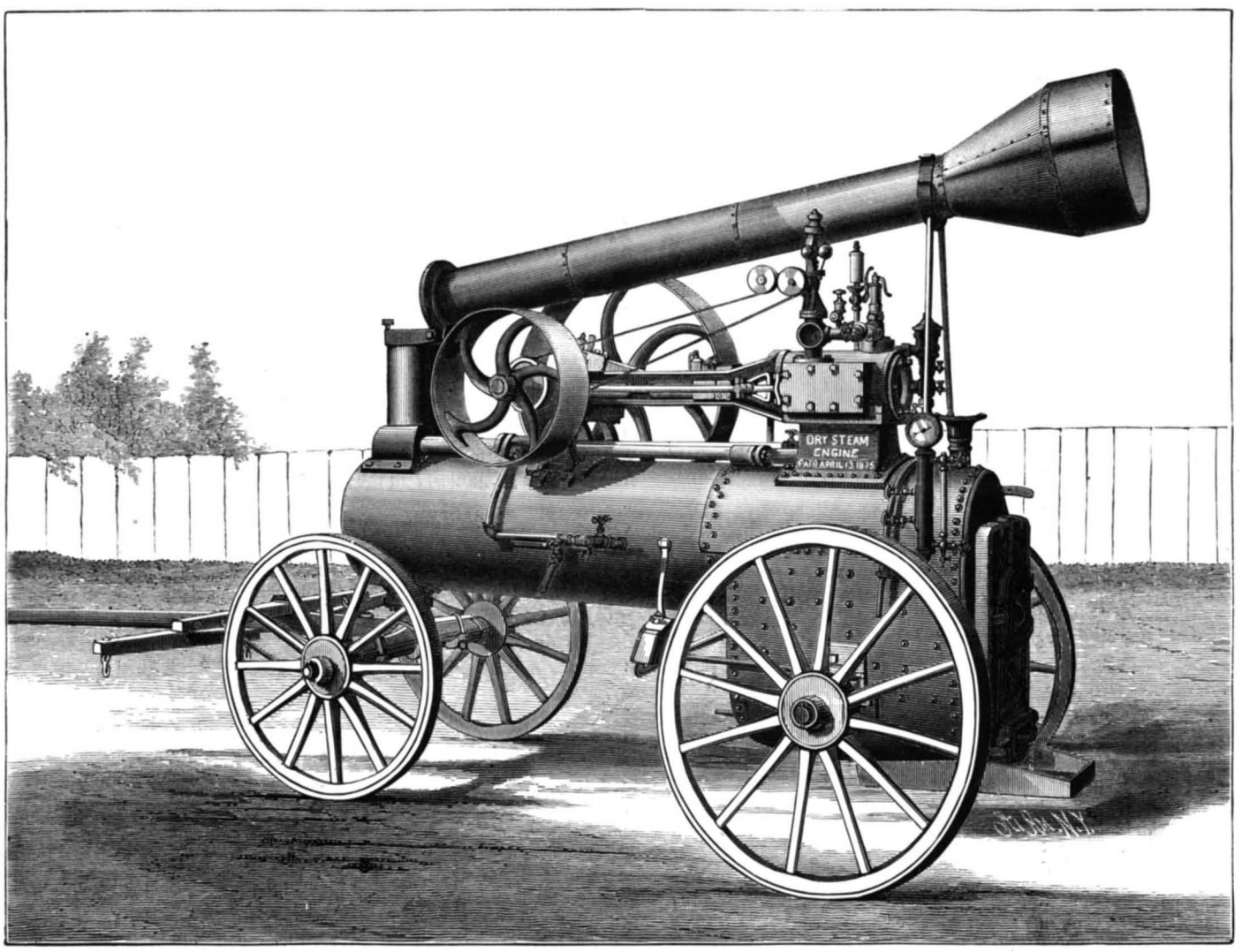
We give an engraving of a 10 horse agricultural engine, 7 x 10 cylinder, built by the Taylor Manufacturing Company, of Westminster, Md., and designated by them as their dry steam engine.

This engine is the same style as the one illustrated in our issue of April 1; we then gave engravings showing the style of boiler and the design of cylinder and dome, together with the indicator card. There are in this style of engine many features interesting to those concerned in steam power.

The manufacturers claim that in this engine steam is transmitted to the cylinder with but very little loss, retaining its full pressure and power nearly to the end of the stroke, varying but little from boiler pressure, consequently giving high results in power developed for an engine having a cylinder of this size.

The crank bearings or journal boxes are large, and have gibs for quarter adjustment. The guides are the usual locomotive pattern, and the crosshead has large and ample wearing surface. The connecting rod is made of the best hammered iron, the straps being keyed and bolted and well fitted with gun metal boxes.

The box in the crank end of the rod is made square to prevent rocking. The crank shaft, which is of good size, is forged of the best hammered steel. The fly-wheels are heavy and carefully balanced. Much care is taken in the casting of the cylinder so as to have good wearing metal.



"DRY STEAM" TEN HORSE POWER AGRICULTURAL ENGINE.—MADE BY THE TAYLOR MANUFACTURING COMPANY, WESTMINSTER, MD.

The piston is fitted with brass and Babbitt packing rings, all joints of the rings being ground and fitted so that the rings may readily adjust themselves to the surface of the cylinder.

The slide valve is of the usual D valve pattern, proportioned on correct principles. The steam ports are large and the distance to the cylinder short, giving the best results for a quick-acting engine. Eccentric strap is made in halves, and the eccentric rod is connected to the valve steam wrist-pin by means of an adjustable brass box. The engine is fitted with either pump or inspirator, as is desired, and is provided with a heater that surrounds the exhaust pipe nearly through its entire length.

The exhaust steam heats the feed water, and escapes through a pipe into the smoke stack. A nozzle is placed on the end of the exhaust pipe, by which the effect of the escaping steam can be regulated at will and made to produce a very strong draught if desired.

The Pickering governor used in connection with this engine is provided with a double valve that does not stick, and also with a stop motion that prevents the engine from running away in case the governor belt breaks. The speeder attachment is so arranged that the speed of the engine can be changed fifty revolutions or less without altering the size of the pulleys or stopping the engine. The engine is provided with automatic glass oilers and cylinder lubricator, a full set of wrenches, oil can, and, in fact, everything that should be found on a perfect engine. The boiler is made of the best Pennsylvania charcoal iron and carefully fitted. A successful boiler is a necessary counterpart of a good engine, and no matter how well an engine may be built, if particular care and judgment is not exercised in the proportions and constructions of the boiler, satisfactory results cannot be attained from the working of the engine. There are certain particular points in the construction of a boiler that are important; perhaps the most important is the proper staying of flat surfaces, especially the crown sheet. This engine is mounted on substantial wheels, and is exceedingly well adapted for transportation from place to place. For further details in regard to its construction we refer to the article above alluded to.

Besides this style of portable engine, the company builds the well known Utica engine, a new side-bed called the Tiger engine, the vertical Boss Clipper engine, and cut-off stationary engines from 12 to 200 horse power.

The company is now building large shops at Chambersburg, Pa., where it will remove November next, and will have increased facilities for its growing business. For further particulars, address Taylor Manufacturing Company, Westminster, Md.

The Philadelphia Elevated Railroad.

The newly completed elevated railway through Filbert street, Philadelphia, with its connections, comprises $1\frac{7}{10}$ miles of main track, with sidings, making the system equal to ten miles of single track. It includes all of the tracks from the Broad street station to the old passenger depot at Thirty-second and Market streets and to the West Chester crossing on the Junction Railroad under the South street bridge. All the terminal passenger traffic of the Philadelphia, Wilmington and Baltimore, West Chester lines, main line of the Pennsylvania Railroad, and New York division, is concentrated at the Broad street station.

At the station there are four inbound and four outbound passenger tracks and four freight tracks. At Seventeenth street these narrow to four tracks, widening to nine tracks at Eighteenth street. At Twentieth street and out to Thirtieth street there are but three tracks, which widen to seven passenger and one freight at the latter locality.

The trains handled daily at the Broad street station are said to be more numerous than at any other terminal station in the world. The schedule shows a list of 129 arriving and 131 departing passenger trains daily, or a total of 260, with additional sections of at least eight of these trains arriving and departing daily except Sundays. There are also about nine freight trains arriving and departing daily. At some hours of the day the movements of trains are more numerous than the average, as between the hours of 5 and 5:30 P.M., when seven trains arrive and eight depart, an average of one train every two minutes, in addition to the movements of empty cars. The total daily number of train movements is over 1,100.

The movement of all these trains is controlled by an interlocking switch system, devised by H. F. Cox, Engineer of Signals. There are several signal towers: the one at Seventeenth street governs every movement of inbound trains between Fifteenth and Twenty-first streets, all outbound from Fifteenth to Nineteenth, and all shifting trains between Fifteenth and Twenty-first, including the placing of cars in and out of the station.

The operator has under his direction sixty levers in the second story of the tower, which are connected with pipes $1\frac{3}{8}$ inches in diameter, to move the switches and signals, he knowing the movements which should be made either by the time table or telegraph. This operator has two lever men, who do the mechanical part of pulling the levers as he may direct. The mechanism requires the pulling of from six to fourteen levers to perfect the movement of any switch or signal, and they must be moved in the order prescribed. It is somewhat similar to the combination lock in idea, and it is so arranged that it is impossible for the operator or lever men to make a mistake. There is nothing left to their discretion, as any error is immediately detected by their inability to move the levers unless they follow the precise order of the combination, and the worst that can happen is a temporary obstruction to trains. The safety signal is given to the engineers of trains by pulling the last lever of the combination.

Leigh Smith's Expedition.—Loss of the Eira.—Rescue of Crew.

The missing commander and crew of the Leigh Smith Arctic Expedition in the Eira have been picked up by the search steamer Hope, in Matacchyn Straits, Nova Zembla.

The Eira left England in June, 1881, for a summer cruise toward Franz Josef Land. The run northward was exceedingly fortunate until August 21, when the Eira was caught and crushed between a land floe and pack ice near Cape Flora, Franz Josef Land. The crew were not able to save many stores, and were not prepared for spending the winter in the far north. Yet by good management and good luck in finding an abundance of walrus and bears, they were able to maintain themselves in health until June 21, 1882, when they left Cape Flora in four boats. Favored by an open sea and a good wind, they reached Nova Zembla in safety August 2, landing within a mile of where the rescue steamer Hope was anchored.

Light Power of Railway Lanterns.

Mr. J. C. Prendergast, of the Savannah, Florida, and Western Railway, reports the following tests:

Two stakes, 9 feet apart, measuring 4 feet 6 inches on either side from center of track; stakes were 7 feet high, and on the top of each stake the lamps were hung.

First Test.—One red and one white hand lantern at a distance of 1,168 yards; red light barely visible, red and white lights showing a distance of about 3 feet apart.

Second Test.—One red and one white bull's-eye lantern, 5 inches in diameter, at a distance of 1,752 yards; lights showing nearly together, red light well in sight; but at a distance of 1,898 yards red light disappeared, white light showing plainly.

Third Test.—Red bull's-eye, 5 inches in diameter, and red hand lantern. At a distance of 1,383 yards, red light of hand lantern disappeared, and, at a distance of 1,898 yards, bull's-eye was well in sight.

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FERMENTS AND DISEASES.

"There are scourges that the human species brings upon itself and there are others that it suffers; and that it considers as being more inevitable than the former. Among the latter, epidemic diseases stand in the first rank; and to these man is accustomed to furnish unmurmuringly immense hecatombs, and it is difficult for him to imagine a world in which there is no pest, nor cholera, nor typhus, nor yellow fever, nor syphilis, nor scarlatina, nor many other diseases that I might name did I not limit my enumeration systematically to those whose contagious nature is known and accepted by all. Twenty years ago nothing at all was known about all such diseases, and, had some one taken it into his head to allege that a day would perhaps come when the human species would be rid of them, he would have been met with only a smile of incredulity or even of disdain. To-day, however, such a dream assumes shape, such a hope does not seem unrealizable, and those who do not accept it have no longer the right to consider it as foolish and to reject it with disdain."

Thus expresses himself Mr. E. Duclaux, at the beginning of the remarkable work that he has just published, under the title of "Ferments and Diseases," and in which he gives a complete *exposé* of those modern labors and doctrines of which Mr. Pasteur was the initiator. Our readers are assuredly acquainted with the principles that have been revealed to this illustrious chemist through the study of these innumerable, infinitely small, organized beings which swarm in nature, which make their appearance where the life of superior animals is extinguished, which multiply with a rapidity and fecundity that bewilders the imagination, and which appear to be the true cause of the most dreaded contagious diseases.

There is no one who has not heard speak of the bacteria of charbon, of microbiums, or of vibrios; but those infinitely small beings have not been seen under the microscope by everybody, and it has, therefore, seemed to us that it would be of interest, by making use of the beautiful plates in which Mr. Duclaux's book abounds, to present a few specimens to our readers. The annexed illustrations were drawn under the microscope, and represent magnifications of from 500 to 800 diameters.

Fig. 1 shows the organisms that appear in an organic decoction or infusion, such as that of hay or beef broth, for example, exposed for some time to a free contact with air. On examining a drop of the liquid by the microscope there is found in it a myriad of living beings of diverse forms, such as monads and thin corpuscles (*c*, Fig. 1), which are reproduced by fissiparism, that is to say, each of which divides through a median furrow into two beings that separate and afterward lead an independent life. There is one species known in which the division does not take more than six or seven minutes for its accomplishment. A single individual might consequently produce more than a thousand offspring in an hour, more than a million in two hours, and in three hours more than the number of inhabitants on the globe. Alongside the monads are perceived small granules (*c* and *f*, Fig. 1), which are called *Micrococci;* and, at *a* of the same figure, there are seen infusoria of large dimensions, called *Kolpodes.* These are the beasts of prey of the microscopic world that we have just described. Their organization is quite perfect; they have a mouth and a stomach, and they live at the expense of the smaller beings which they devour; and they even possess contractile vesicles that it is manifestly impossible not to liken to a heart.

This is the world of microscopic beings that was first known, and among which was implanted that doctrine of spontaneous generation that Mr. Pasteur, through irrefutable experiments, has utterly annihilated.

We should like to follow Mr. Duclaux in the complete enumeration that he gives us of this microscopic world; but his book should be read in its entirety, for there is nothing in it that can be abridged; and, in calling attention to it, we shall content ourselves with representing a few other organisms whose role has been most studied in recent times.

In Fig. 2 we have represented, to the left, the bacteria of charbon in artificial cultures, and, to the right, the same in the blood of an animal afflicted with the disease. In Fig. 3 we have the celebrated microbium of chicken cholera—a young specimen being seen to the left and an old one to the right; and, finally, in Fig. 4, we see the septic vibrio that accompanies septicæmia.

On opening the body of a dead septic animal we find therein extensive disorders, which are manifested by a general swelling. On examining by the microscope a drop of the liquid or serosity which fills the abdomen, we find therein, in multitudes (as shown in Fig. 4), moving vibrios that are sometimes very elongated and sometimes very short. The active motions of these organisms, and their abundance, scarcely permit them to be overlooked, and there is reason for surprise that they should have escaped all scientists who occupied themselves with septic diseases before Mr. Pasteur. The refraction of the vibrio, being very near that of serum, renders it difficult to find it; but is discovered at length, however, flexuous, crawling, and gliding along amid the globules of blood, like a serpent among dead leaves.

Such are a few of the microscopic beings, those dread enemies which for ages have passed unperceived, and which science has revealed. Mr. Pasteur has already triumphed over some of them—if not in causing them to disappear, at least in rendering them inoffensive. The road is for the future laid out, and, as Mr. Duclaux says, at its terminus will be found the preservation to their families and country of thousands of existences.—*La Nature.*

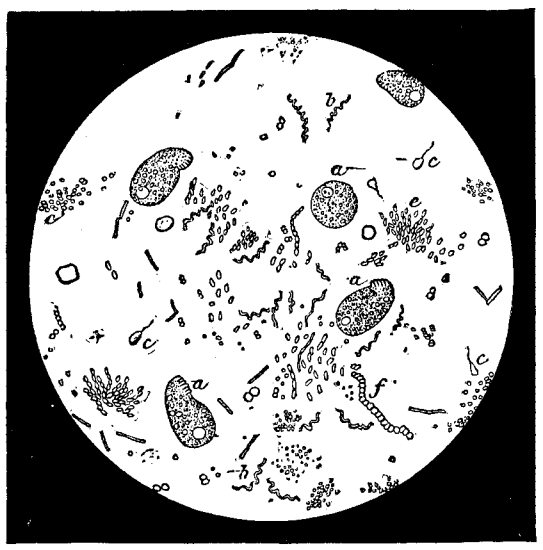

Fig. 1.—ANIMALCULES IN AN INFUSION OF HAY.

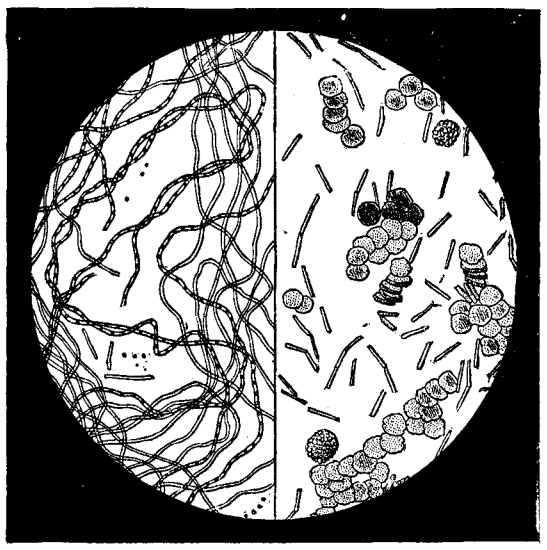

Fig. 2.—BACTERIA OF CHARBON.

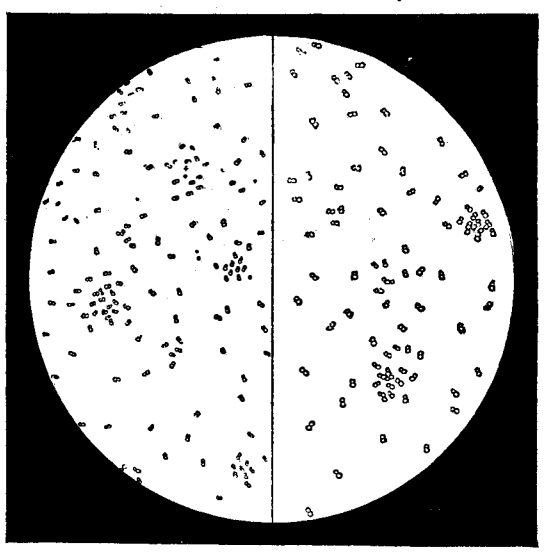

Fig. 3.—MICROBIA OF CHICKEN CHOLERA.

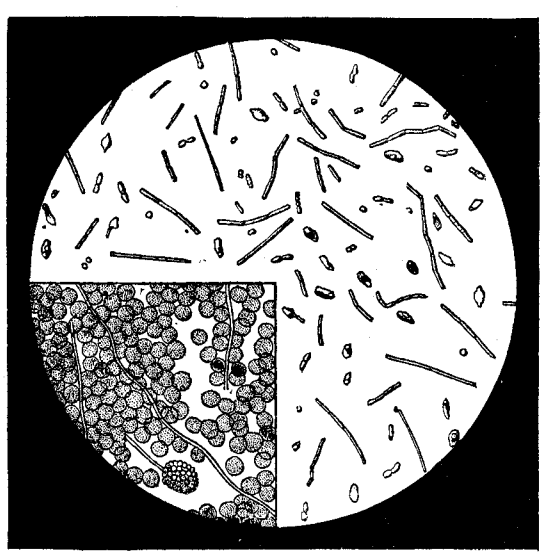

Fig. 4.—SEPTIC VIBRIOS.

Healthy Teeth.

The *Herald* (N. Y.) correspondent with the party in search of the lost crew of the Jeannette has been impressed by the beauty of the teeth of natives of Northern Siberia. He saw old men of sixty and seventy with sets of teeth small and pearly white, polished and healthy. Decay and suffering are unknown. A physician of Yakutsk attributed this to the habits and the kind of food eaten by the natives, and to a certain care taken by them from childhood up. First, the natives do not touch sugar in any form, for the simple reason that they cannot afford to buy it. Secondly, they are in the habit of drinking daily large quantities of fermented sour milk summer and winter, which is antiscorbutic, and is very beneficial in preserving the teeth. And lastly, they have the habit of chewing a preparation of the resin of the fir tree, a piece of which, tasting like tar, they masticate after every meal, in order specially to clear the teeth and gums of particles of food that may remain after meals. The gum or resin is prepared and sold by all apothecaries in Siberia, and is much used by Russian ladies.

FIREPROOF paper may be made, according to the *Pharmaceutische Zeitung*, from a pulp consisting of 1 part of vegetable fiber, 2 parts of asbestos, 1-10 part of borax, 1-5 part of alum. The ink is made from 85 parts of graphite, 0·8 part of copal varnish, 7·5 parts of copperas, 30 parts of tincture of nutgalls, and a sufficient quantity of indigo carmine.

Smoke and Waste.

In the course of his recent address at Leeds, as president of the Institution of Mechanical Engineers, Mr. Percy G. B. Westmacott said:

"We may pride and plume ourselves upon the vast strides which science, art, and engineering have made in our time, but posterity will assuredly lay its finger upon the great blot of waste, and many stigmatize our age as the Black Age, which has spoilt, by careless, unnecessary, and selfish emissions of smoke and noxious gases, many a noble town and many a lovely spot on earth. The smoke nuisance is altogether inexcusable, and cannot be too severely dealt with. Science and art have practically overcome it; and experience enables many, like myself, to assert that money can be profitably laid out and yield good interest in the abatement of this unpardonable nuisance.

"Then with regard to waste, much ingenuity and skill have certainly been displayed, and much work has already been done, to lessen this evil; and the records of our institution will bear witness that many of our members have striven and succeeded well in their efforts to remove this stigma from our age. I would urge upon the younger members of our profession to study this question profoundly and as if the whole of their success in life depended upon it, and never to undertake the smallest piece of work without wrapping it round with economy. Those who carry out this advice will assuredly succeed. May I not go so far as to say that no really good and useful invention is ever wasted or completely thrown aside, even though it may be superseded permanently or for a time by some other invention? This, to my mind, is an important reflection, one extending far beyond professional views; for its realization would greatly assist in alleviating those injurious alarms which are often felt when some new and striking invention bursts upon the world.

"To illustrate this, let us take for an example the present prominent question of lighting. We may go back to the period when the diffusion of light depended upon oil; after a time candles were introduced; then came the great and important invention of gas; and now, at the present time, electricity is being brought into use. Well, what do we find in all these competing agents, each good and useful in its way? We find that not any one of these sources of light exercises a monopoly. Candles have not interfered with the use and progress of the oil lamp; gas has not snuffed out candles, nor stopped the flow of oil for lighting purposes; and I do not hold with those who believe that electricity will totally eclipse gas. Or, again, let us take for example the means of transport across the land. Rough and miry tracks were, first of all, made for cattle traffic; they were then improved for horse and cart traffic, and these were still further developed by Macadam for swift-running carriage traffic.

"Then there were canals; and, lastly, railways, which owe their origin to the very simple idea of confining the run of vehicles to a defined line of hard rails. This happy idea laid the foundation of that great development of mechanical traffic which has assisted to open out and spread abroad the riches of the world, and has given to science and mechanical art a wide field of labor. Thus a new system of transport may become the main artery through which material is moved and spread over the land; but the increased facility which such an improved system of conveyance gives, and the enlargement of trade which results therefrom, require increased feeding powers; and thus the system which one day is the principle artery forms another day the side arteries. And yet the amount of work done by the old system is not necessarily diminished; on the contrary, it may be very materially increased by the impetus of improvement in some other direction and by the benefits of competition. Now, it may at first sight seem singular that railways, lessening, as they have done, to an enormous extent the cost of land carriage in comparison with cart traffic, have neither done away with horses and carts, nor drained canals of their freights. On the contrary, there is more horse and cart traffic than ever; indeed, railway companies are among the largest proprietors of horses, and the most extensive carters in the country."

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DECISIONS RELATING TO PATENTS.

United States Circuit Court—Southern District of New York.

THE AVERILL CHEMICAL PAINT COMPANY *vs.* THE NATIONAL MIXED PAINT COMPANY *et al.*

Wheeler, J.:

This suit is founded upon reissue letters patent, No. 7,031, dated April 4, 1876, granted to Damon R. Averill, assignor, for an improvements in paints. The claim is for—

"A mixed liquid paint composed of oxide of zinc or other pigments, oil, turpentine or benzine, water, and one or more emulsating agents put up in tight vessels or cans."

The original patent was No. 66,773, dated July 16, 1867, for an improved paint compound, particularly described by ingredients and quantities, like that in the reissue, but with lime water and silicate of soda, which were emulsating agents, but not stated to be such, specified as parts of the combination and compound. The claim was for—

"A paint composed of the ingredients herein named and prepared and compounded, substantially in the manner specified."

There was no allusion in the patent to anything to contain the paint. Liquid mixed paints produced by the use of emulsating agents were known and used before Averill's discovery, and paints had been contained in cans and other tight vessels before that time, but no paint had been made by the use of his precise combinations and ingredients before.

On the application for a reissue the patentee made proof that prior to his application for the original patent he had put up his paint in cans and other tight packages, and noticed its advantages for being put up in that way, which appears to have been satisfactory to the Commissioner that this mode of packing was a part of the original invention, and upon that proof the reissue appears to have been granted. The defendants do not use the combination or compound described in the original patent.

The principal defenses are that the reissue is not supported by the original, and is therefore void; that the patentee was not the original and first inventor of the invention described in the reissue; and that if the reissue can be upheld at all the defendants do not infringe any part for which it is valid. The original patent was valid enough apparently for the particular kind of paint described in it. The reissue, if it is for that kind of paint only packed in tight vessels, may be valid, for it would merely narrow the scope of the claim upon the same invention from that kind of paint everywhere to that kind of paint only when so packed; but the reissue is not limited to that particular kind of paint. It extends to all forms made from the same ingredients, other than the emulsating agents specified, by the use of any emulsating agents. This expands the original patent not only beyond the scope of the claim upon the invention described, but beyond the scope of that invention.

A patent for a particular kind of liquid mixed paint expanded in reissue to cover all kinds of liquid mixed paints when packed in tight vessels, the invention of packing in vessels not being at all described or even alluded to in the original patent, *Held* to be invalid for new matter.

The Commissioner of Patents is not authorized to grant a reissue of a patent for an invention in addition to that shown in the original in cases where there are no drawings nor models, upon proof that the addition was really a part of the same invention sought to be patented in the original.

A reissue patent must in all cases be for the same invention as that contained in the original patent, and the last clause of section 4,916 Revised Statutes merely governs the manner of proof, but does not authorize the Commissioner to grant a reissue for a different invention, or to determine that one invention is the same as another or different one, or that two inventions essentially distinct constitute but one.

Bill dismissed.

CROSS *vs.* MACKINNON.—PATENT FOUNTAIN PEN.

Wheeler, J.:

Letters patent, No. 199,621, for an improvement in fountain pens, the principal distinctive feature of which is a spring working between the vibrating writing pin and the air tube to project the pin and restrain the flow of ink, examined and found to be valid.

A weight to project the writing pin not the equivalent of a spring for the purpose desired, the efficiency of the weight in this connection being impaired by its necessary confinement in a small working space and the necessary inclination of the pen from a perpendicular both when in use and out of use.

The patent infringed by one who has the spring inside the air tube instead of outside, whether or not it might be decided that the change is an improvement in the manner of attaching the spring to the tube.

The orator has a patent, numbered 199,621, for an improvement in fountain pens, the principal distinctive feature of which is a spring working between the vibrating writing pin and the air tube to project the pin and restrain the flow of ink when the pen is not in use, and yield to the pressure on the point of the pin and make room for the flow of ink when the pen is in use.

The defense of non-infringement rests upon the fact that the defendant has the spring inside the air tube instead of outside. This may be an improvement upon the plaintiff's mode of attaching the spring to the tube; but if it is it is none the less a use of his arrangement. They make use of the same parts for the same purpose in substantially the same way.

Let there be a decree for the plaintiff according to the prayer of the bill.

NEW *vs.* WARREN.—PATENT TANK FOR CEMENTS.

Wheeler, J.:

This suit is brought upon reissue letters patent, No. 6,683, Division A, and No. 6,684, Division B, dated October 5, 1875, founded upon original letters patent, No. 147,423, dated February 10, 1874, granted to the orator for an improvement in tanks for asphaltic cement. The defenses are want of novelty, that the reissues are too broad for the original, and non-infringement.

A combination claim is not infringed by the use of any of the elements less than all.

A patent may be reissued in divisions, but the patent cannot be broadened in that way any more than if reissued together.

A patent for a machine cannot be broadened on reissue to cover a process described in the original patent. If the process was patentable it should have been included in the original patent.

The mere operation of a machine does not constitute a patentable process. It is not a chemical process, nor any other for transforming the subject of it into another state.

Let there be a decree that Division B is invalid, that the defendant does not infringe Division A, and that the bill be dismissed, with costs.

United States Circuit Court.—District of Connecticut.

COES *vs.* THE COLLINS COMPANY.—PATENT WRENCH.

Blatchford, J.:

This suit is brought on reissue letters patent, No. 3,483, granted to Loring Coes, the plaintiff, June 1, 1869, for an improvement in wrenches, the original patent, No. 40,590, having been granted to Thomas H. Dodge, as assignee of George C. Taft, the inventor, November 10, 1863, for an improvement in wrenches.

A claim drawn up in terms to cover a result, viz.: An improved Coes wrench, so constructed that the thrust or back strain of the rosette-screw when the wrench is used shall be borne by the shank, instead of the handle, of the wrench, construed, in view of the state of the art, to be for the specific devices described in the patent, and *Held* not to be infringed by defendant's article, which attained the same result by a different means.

Bill dismissed.

Rapid Track Laying.

Laying a mile of railway track involves carrying and placing in exact position from 2,640 to 3,000 ties, bringing forward and laying down, exactly the right distance apart, 352 rails (if of 60 pounds to the yard), each 30 feet long and weighing 600 pounds, or an aggregate of nearly 94½ tons, or 211,200 pounds, and fastening the rails to each other by fish plates and bolts, and to the ties by four spikes in each tie.

The *Railway Age* describes the manner in which the work of laying two miles of track a day is done by means of the latest devices.

A train of flat cars with an engine to push it stands on the newly finished track. Upon the top of the cars a track of about eight feet gauge has been laid, the spaces from car to car being filled by short pieces of rails held by peculiar joint fastenings, so as to allow sufficient play as the cars are pushed together or pulled apart, and easy removal of the short rails when the day's work is done. On this track a small car, pushed by hand, runs, carrying ties to the front. The car is fitted with a dumping arrangement, so that as the wheels reach the end of an extension on the front car the small car tips the load of ties down upon the grade. They have hardly fallen before they are picked up by the active gang of men and laid in place, the exact space between ties being indicated by a long pole with white marks, laid at the side. As soon as each tie is laid a young man follows with a gauge and marks with red chalk the outer line for the rail.

Meantime two men are pulling a pair of rails rapidly forward upon iron rollers fixed in the top of the cars; as they reach the end the rails slide down upon movable stands or trestles, with rollers on the top, which stand on the ties to receive them, and before they reach the ground they are quickly and easily picked up by the gang and laid in place on the ties. Another pair of rails follow; bolts and spikes have meantime been placed on the ground by an attendant boy, and in a moment the fish plates, which were fastened on one end of each rail before it left the car, are bolted in place, the spikes are driven home, and at a signal the watchful engineer backs the train up another length of two rails, or sixty feet. Then another load of ties comes thundering down on the grade, and so the process goes on.

The writer timed the work and saw twelve pairs of rails, or six double lengths between each dumping of ties, laid and half spiked in 21 minutes, so that the train could move over them. The rails being thirty feet long; this speed, in a day of ten hours, would suffice to lay 10,284 feet of track, or not much less than two miles a day.

Practically, however, this rate would seldom be kept up all day, although with a larger force of men and working more hours it could apparently be considerably exceeded. The force engaged at the time referred to numbered only twenty-six, as the contractor did not wish to hurry the work for fear of overtaking the graders.

Weights and Measures.

The following system of decimal weights and measures is thought to be greatly preferable to the metric.

I. LINEAR MEASURES.

1 stroke = ½ millimeter.
1 mesh or barleycorn = 10 strokes = ½ centimeter.
1 nail or thumb = 10 meshes = ⅛ decimeter.
1 ell or cubit = 10 nails = ½ meter.
1 rod or fathom = 10 ells = ⅛ dekameter.
1 chain = 10 rods = ½ hektometer.
1 guild = 10 chains = ½ kilometer.
1 league = 10 guilds = ½ myriameter.
1 degree = 20 leagues.
1 quadrant of the earth = 100 degrees.
1 yard = 2 ells.

II. AGRARIAN MEASURES.

1 span (arm-span) = ½ centiare.
1 rood or loughter (Germ. lachter) = 100 spans = ⅛ are.
1 acre = 100 roods = ½ hektare.

III. MEASURES OF VOLUME.

1 cord = 2½ x 2½ x 5 ells.
1 perch = 2 cords.

IV. WEIGHTS.

1 minim (Lat. minimum) = ½ centigram.
1 grain (Lat. granum) = 10 minims = ½ decigram.
1 bead (Lat. siliqua) = 10 grains = ½ gram.
1 drachm (Lat. drachma) = 10 beads = ½ dekagram.
1 ounce (Lat. uncia) = 10 drachms = ½ hektogram.
1 pound (Lat. libra) = 10 ounces = ½ kilogram.
1 stone = 10 pounds = ½ myriagram.
1 quintal = 10 stones = ½ metric quintal.
1 wispel (Germ.) = 10 quintals = ½ metric ton
1 ton = 2 wispels = 1 metric ton.

V. MEASURES OF CAPACITY.

1 drop (Lat. stilla) = $\frac{1}{20}$ milliliter.
1 ard (Germ, Lat. fluidsiliqua) = 10 drops = ⅛ milliliter.
1 cruet or quain (Germ. quentchen, Lat. fluiddrachma) = 10 ards = ½ centiliter.
1 noyel (Germ. noesel, Lat. fluiduncia) = 10 cruets = ½ deciliter.
1 pint (Lat. octarius) = 10 noyels = ½ liter.
1 gallon (Lat. congius) = 10 pints = ½ dekaliter.
1 anker, firkin, bushel = 10 gallons = ½ hektoliter.
1 tun, pipe (of wine or beer), malter (Germ. of grain) = 10 ankers = ½ kiloliter.
1 load = 2 tuns = 1 kiloliter.
1 quart = 8 gills.
1 gallon = 4 quarts.
1 bushel = 4 pecks.
1 rundlet, kilderkin = 2 ankers.
1 tierce = 4 ankers.
1 hogshead = 6 ankers.
1 puncheon = 8 ankers.

As will have been noticed, the Latin terms have been added to the measures needed for apothecary purposes. The terms of the present system have been transferred as much as practicable. For the balance, partly German terms, used already for a similar purpose, have been transferred, partly words inserted whose original meaning already points to the measure. The term "guild" is analogous to "league," "mesh" to "link," "minim" belongs without doubt more properly to the weights; "bead" has probably been formed from "bean-beden," from the ancient habit of saying the beads with the help of beans, and as several varieties of beans *e. gr.* the castor-bean, come very close to the weight in question, this term and its Latin version seemed to be appropriate. The "ell" and "rood" are hardly any more used at their present size, but both would probably have the popular preference to the others proposed, while "ell" would be also used by the other Teutonic nations whenever they would calculate by this system.

The main and incalculable advantage of this system would be that the main measures and weights of the old system, *e. gr.* the cubit, rod, league, grain, pound, quintal, drop, pint, gallon, anker, kilderkin, tierce, etc., are very nearly represented in the units above-proposed, thus very little change would be necessary, the introduction without difficulty, and the main units were, just opposite to the metric, of a most handy size. This also would apply to the "guild" and "league," the former adapting itself most excellently for measuring heights, depths, etc., while a measure similar to the league, mostly by the name of "hour," has been very much used for many centuries in Europe as road measure, comes very close to the nautical league, and is undoubtedly within the range of an exclusively handy measure for that purpose. As the interchange with the metric system could be had by doubling and halving, the end of a universal notation would not be greatly impeded by the change.

It thus seems that the above proposal, allowing that some of its nomenclature will have to be amended yet, will meet with the demands. P. RUSTEMEYER, M.D.

Hamburg, Ill., August, 1882.

Large Watermelons.

By carefully pruning and protecting his vines, and allowing but one or two melons to ripen on each vine, a Georgia farmer succeeds in getting watermelons weighing sixty pounds and more. One growing melon weighed sixty-five pounds August 23, and was expected to reach seventy or seventy-five pounds by the time it was fully ripe. These melons bring from fifty cents to a dollar each at the nearest town. The secret of his success, he claims, is in judicious pruning, an art to be learned only by experience.

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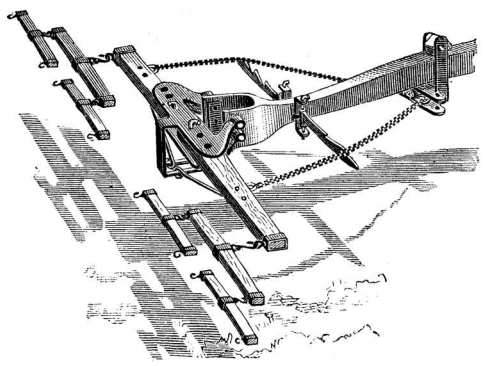
RECENT INVENTIONS.

Carr's Draugh. Equalizer for Sulky Plows.

A device for equalizing the draught between teams of horses, where four horses are used abreast, on sulky plows, has been patented by Mr. Dallas Carr, of Chandlersville, Ill. The device consists in two jaws, forming a double clevis, attached to the front end of the beam of the plow, and so arranged that by means of a series of holes in the jaws the plow may be regulated to run at a greater or less depth, and also to cut a furrow of any desired width. Two



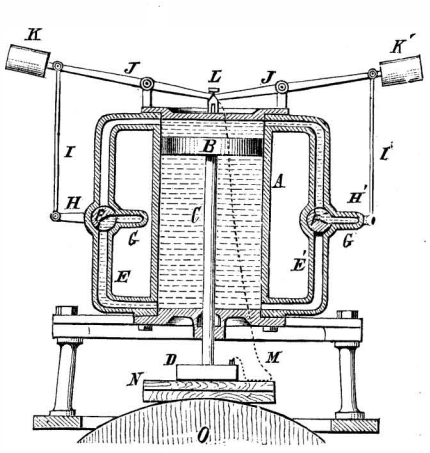
levers of different lengths, to which the draught eveners of the team are secured, are pivoted one on either side of the jaws, and are connected by a chain that passes around a sheave secured on the under side of the draw bar. By this means the draught is equalized between the two beams. Swinging arms, pivoted to the sides of the beam, sustain the chains and hold them so as to draw straight from the equalizing levers. The invention will readily be understood by reference to the annexed engraving.

Brokaw's Block Presser.

An improved presser for pressing the blocks of wood from which pulp for paper is to be made, upon the abrading surface of the cylinder of a pulp machine, has been patented by Mr. Norman H. Brokaw, of Marinette, Wis.

The block, N, of wood is pressed down to the grinder, O, by a block, D, attached to the lower end of a rod, C, on the upper end of which is a piston, B, moving in a cylinder, A. The cylinder is connected at its opposite ends by pipes, E E', provided with threeway cocks, H H', levers, J J', connected by rods, I I', with the valves of the cocks.

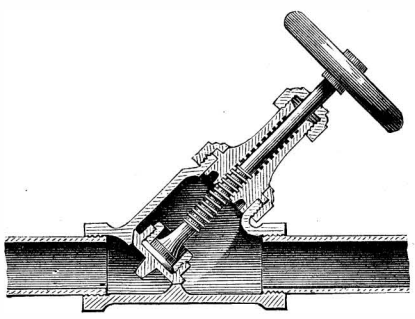
These levers are pivoted to the tops of the cylinders, and



have at their outer end weights, K K'; at their inner ends they engage with a latch, L, at the center of the cylinder. Steam or water is admitted through the pipes, G E, to the cylinder, and the block is pressed down until it is sufficiently cut away, when the latch is released by a chain, M, connected with the presser, D, when the weights fall, reversing the cocks and raising the piston and presser block.

Improved Valve.

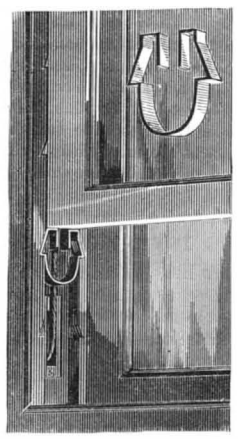
Improvements in globe and check valves have been patented by Mr. Frank P. H. Prox, of Terre Haute, Ind. In the valve, as shown in the accompanying engraving, the body is formed at an angle of about forty-five degrees with the channel of the valve. The valve seat in the channel is placed at an angle to correspond with the inclination of the body, and the valve seat is fitted and ground in the usual



manner. When the valve is opened a nearly straight, unobstructed passage is provided for the fluid, and the friction of the flow of the fluid is reduced to a minimum. In the check valve the stem has a longitudinal aperture opening at its side into the outlet portion of the valve chamber, thereby preventing any retardation in the movement of the valve by vacuum action.

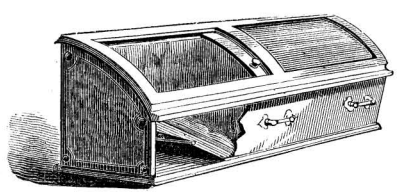
Sash Fastener.

An ingenious fastener for securing sliding window sashes when they are closed, and for supporting them when open, has been recently patented by Mr. William P. Hayhurst, of Argentine, Kan. The window frame has suitably shaped notches arranged opposite each other in the stops between which the sashes of the window slide. The fastening device is shown at the bottom of the annexed engraving, and consists of a thin piece of spring brass or steel bent to form a bow of a proper width to fit into the spaces between the stops over or beneath the sash, accordingly as it is to be used as a fastener or support. On the sides of the bow are projections that, when the fastener is in place, engage with the notches in the window stops. The lower ends of the fastener rest on the window sash, the portions projecting toward the center of the loop being used as finger-pieces for pressing the device together for inserting in the grooves, the spring of the metal retaining them in place.



Tickner's Burial Casket.

In the accompanying engraving is shown a burial casket that has recently been patented by Mr. John J. Tickner, of Bancroft, Mich. In the bottom of the casket is an inclined head rest, that is fitted loosely. On the under side of the rest is hinged a metal strap having a projection that engages with any one of a series of holes in a plate attached to the bottom of the casket, so that the head rest may be set

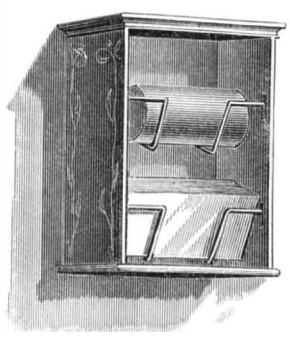


to different inclinations. With this device provision is made for arranging the head and upper part of the body, so as to be more or less elevated, to give the corpse a more natural and life-like position.

One side of the casket is raised, giving the cover an inclined position, so that the body may be viewed from the side of the casket.

Envelope Case.

A novel and very convenient case for holding envelopes has been patented by Mr. Jacob C. Lane, of Elkhart, Ind. The case may be divided in a number of compartments by partitions. A rack made of wire, in the shape shown in the accompanying cut, is secured at its front ends by being hooked into grooves in the sides of the case, and has its rear end inclined upwardly, so that a roller placed on the inclined part, behind the envelopes, serves to support them, and slide them to the front of the rack as they are removed. The case is adapted to hold different sizes of envelopes and postal cards, and presents the face of the envelope to the view of the user, so that a person sees at a glance the size or denomination of the envelope, and no mistakes are made in selecting.



The Gum Trees of Australia.

The ranges are covered with a dense forest of gum trees, in many places of enormous height, standing with their smooth trunks close together and running up often for a height of 200 feet without giving off a branch.

The light-colored stems are hung with ragged strips of separated bark.

The great slenderness of the trunks of these giant gum trees, in proportion to their height, is striking, and in this respect they contrast most favorably with the Californian "big trees," which, in the shape of their trunks, remind one of a carrot upside down, so disproportionately broad are they at their bases. The large species of gum tree, the tallest tree in the world, is *Eucalyptus amygdalina.*

As Baron von Müller says: "The largest specimens might overshadow the Pyramid of Cheops"

Grisebach, in his account of the vegetation of Australia (A. Grisebach, "Vegetation der Erde," p. 216, Leipsic, W. Engelman, 1872), dwells on the close relation of interdependence which exists between the tree vegetation and the coating of grass which covers the ground beneath it, and remarks that the amount of light allowed by the trees to reach the ground beneath them is rendered more than usually great by the vertical position in which their leaves grow; hence the growth of the grass beneath is aided.

It may be that this, permitting of the growth of other plants beneath them, and consequent protection of the soil from losing its moisture, besides other advantages to be derived, is the principal reason why, as is familiarly known, two widely different groups of Australian trees, the eucalypti and acacias, have arrived at a vertical instead of a horizontal disposition of their leaves by two different methods. The acacias have accomplished this by suppressing the true horizontal leaves and flattening the leaf-stalks into vertical pseudo leaves or "phyllodes."

The gum trees, on the other hand, have simply twisted their leaf-stalks, and have thus rendered their true leaves vertical in position.

There must exist some material advantage which these different trees derive in common from this peculiar arrangement, and the benefit derived from relation to other plants by this means may be greater and more important than that arising from the fact that the vertical leaves have a like relation to the light on both sides, and are provided with stomata on both faces. In support of this conclusion I was told, when at Melbourne, that when the native vegetation was cleared away from under gum trees they ceased to thrive, and in time perished.

I was shown a number of gum trees, not far from the city, scattered over some public land, covered with only short turf, which seemed to be mostly in a dying condition.—*H. N. Mosely, Challenger Notes.*

Telephonic Vibrations.

"Everybody is aware," says M. Salet, in a recent paper to the Paris Academy, "that it is possible to hear through a thin door of pine, words spoken in an apartment that is otherwise quite closed. In this case the sonorous vibrations transmitted by the air agitate synchronously the wooden board, and this in turn transmits its movement to the outer air as a piston would. This familiar experience must have struck physicists, as giving proof of the exquisite sensibility of the ear. The vibrations of the board are indeed very small, hardly greater than those of the membrane of a telephone receiver in action; but these latter are so weak that their existence has sometimes been called in question. They exist, however, and I proceed to give an idea of their amplitude."

The method adopted by M. Salet was as follows: He fixed on the iron diaphragm of a Bell telephone a small glass disk weighing 0·45 gramme, and in front of this was supported a second, furnishing with it Newton's rings. The arrangement resembles that devised by M. Fizeau for study of dilatation. When one speaks at a distance of about six yards from the telephone, or sends into the instrument the telephonic current from a good transmitter (that of Bottcher, *e. g.*), the rings are observed to lose their distinctness, and disappear if the voice be a little forced. They vibrate, indeed, synchronously with the diaphragm, and nothing is simpler than to calculate, from the amplitude of their oscillations, that of the vibrations of the membrane.

It is certain, however, that the surcharge of the diaphragm with the disks must lessen the movements slightly; thus the results obtained err probably by defect rather than by excess.

To estimate the displacement of the rings, M. Salet arranges before the receiver telephone, which is caused to emit a continuous sound, a turning disk pierced with slits, like that of a phenakistiscope. One finds that, with a certain velocity of rotation, the rings reappear with distinctness. On blowing then through the disk, so as to make it act as a siren, it is found that the sound produced is in unison with that transmitted by the telephone. If it be slightly lowered or raised, immediately the rings oscillate, at first slowly, then with such rapidity that they become invisible again. While they oscillate one may easily estimate their displacement; in one experiment, the *la* of the diapason being emitted into the transmitter with the vowel *u* (*ou*), and with moderate intensity, the displacement was nearly equal to the distance of two consecutive rings, and the amplitude of vibrations of the receiving plate would thus be two to three ten-thousandths of a millimeter.

If there be sent into the telephone currents of different intensities, but very weak, and each of which, *e. g.*, does not cause displacement of the rings beyond half the distance separating them, one may, by considering a point of the glass disk, infer from its brightness the intensity of the current. This singular galvanometric process, says M. Salet, might undoubtedly be utilized in the telectroscopic receiver.

Treatment of Diphtheria.

The *Medical Press* says that Dr. Deuker, who, during twenty-four years of very extensive practice in the Children's Hospital, St. Petersburg, has treated upward of two thousand cases of diphtheria, and tried all the remedies, both internal and external, employed in this affection, has obtained the best results from the following method, which he has employed for the last ten years. As soon as the white spots appear on the tonsils he gives a laxative mainly composed of senna, which produces an abundant evacuation. When the purgative effect has ceased he gives cold drinks, acidulated with hydrochloric acid, and every two hours a gargle composed of lime water and hot milk in equal parts. Dr. Deuker affirms that when this treatment is commenced early it is generally and rapidly successful.

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ENGINEERING INVENTIONS.

Mr. Thomas V. Tucker, of Henderson, Ia., has patented a car coupling of novel construction. The draw head of the car has on its top a vertical sleeve in which the coupling pin works, and a lever, having suitable connections, raises the pin from either the top or side of the car. A sliding spring latch holds the pin up. The link is provided with lateral projections that engage with the spring catch to release the pin.

Mr. Cornelius Kunkel, of Oregon, Mo., has patented improvements in windmills, in which the feathering of the wings of the windmill, to prevent too great velocity, is controlled by mechanisms connected with weighted levers, moved out and in by centrifugal force. The hub of the wind wheel is countersunk from its rear end, whereby the weight of the wheel is brought over the main bearing, and overhanging of the wheel is prevented. Suitable devices for starting and stopping the wheel are also provided.

The object of an invention that has been patented by Mr. Cornelius Gorham, of De Soto, Mo., is to economize labor in handling coal in coaling locomotives. It consists in a portable coal chute, mounted on a truck of peculiar construction, and adapted to be tilted to discharge its load, enabling the fireman to coal the locomotive without other assistance. Tracks and storage platforms are also provided by which the loading and unloading of the chute are facilitated.

Improvements in the class of dredging buckets, called clam shell buckets, has been patented by William A. T. Sargent, of Wilmington, Del. The ordinary bucket is constructed of two partially cylindrical shells, and is often extremely difficult to hoist out of the material in which it has been embedded on account of the suction produced. The improved bucket is composed of four buckets instead of two, the upper buckets cutting a larger circle than the center ones, and displace sufficient material at the sides to allow the water to pour in and prevent the formation of a vacuum when the bucket is hoisted.

Mr. John J. Carrier, of Waseca, Minn., has patented an automatic car coupling. A plate that has at its inner end a pocket for receiving the end of a car link rests flat in the bottom of the opening in the drawhead, and is raised more or less to elevate the link for coupling by a crank. A sliding plate on top of the drawhead supports the coupling pin above the opening, and by a rod at the end of the drawhead is moved back when the cars are run together to couple. When the plate moves back the coupling pin drops, and the cars are coupled.

MECHANICAL INVENTIONS.

A machine for welding plowshares and landsides has been patented by Messrs. Joseph Myers and Thomas B. Simonton, of Superior, Neb. To a bed plate are secured a fixed and a movable jaw of proper shape and thickness to grasp and press the land side and plowshare at the point to be welded. A lever for working the movable jaw is pivoted to the bed plate, and has an eccentric head that presses the jaw up with great force. The parts to be welded, when sufficiently heated, are placed between the jaws, which are quickly forced together by the lever, thus performing the work perfectly and quickly.

A reversible mechanism for counter shafts has been patented by Mr. Christian E. L. Moebius, of New York city. The driving pulley runs loose upon a counter shaft revolving in suitable hangers, but is prevented from longitudinal movement on the shaft. The pulley carries the shaft with it by means of a clutch, that slides upon the shaft and engages with clutch teeth formed upon the pulley. Upon the inner surface of the rim of the pulley is attached a gear wheel, and by suitably arranged intermediate gear wheels and a clutch the motion of the pulley is changed as desired.

An improved cutter for leather whitening machines has been patented by Mr. John E. Clement, of Peabody, Mass. The cutter head is a cylinder of slightly greater length than its diameter, and in grooves formed in the head are secured cutters made of thin blades of metal bent in V form, each wing being formed as a spiral on a pitch equal to the length of the cylinder. The angles of the cutters are at midlength of the cutter head, and the wings extend to the ends of the head. The cutters act on the leather with a shearing cut, from the center outward, the operation being similar to slicker whitening done by hand.

Mr. Johnathan B. Richards, of Wager, Ark., has patented an improved bench pin attachment that can be applied to the ordinary wood worker benches. The attachment is so constructed that it may be moved horizontally to be adapted to lumber of different lengths, and it may also be moved vertically to adapt it to be used with both high and low vises, and for holding lumber of different widths. The attachment is cheap and simple, and seems well adapted for the use intended.

Messrs. Thomas Donahue and William W. Cone, of Terrysville, Ct., have patented improvements in hasp locks for trunks and chests. Such locks have heretofore been made of cast metal, making the locks expensive. This invention consists in hasp locks made in all its parts of punched and stamped sheet metal, the parts being stiffened by raised edges and by tongues folded on the inner surfaces of the plates. A lock made in this manner is light and strong, and cannot readily be broken by blows.

AGRICULTURAL INVENTIONS.

An improved check row corn planter has been patented by Mr. Joseph Morava, of Castle Rock, Wis. The improvements consist in devices by which the upright tubular seed boxes can be raised and lowered to plant the seed at any desired depth in the ground, and may be turned into a horizontal position, so that the machine can be turned or taken from place to place. Suitable mechanisms operated by the wheels also control the planting of the hills, so that they are properly check-rowed in the field.

Messrs. Benjamin Stalcup and George W. Stewart, of Worthington, Ind., have patented improvements in a band and feed cutter for which they received Letters Patent 247,427. The improvement consists in placing between the knife shaft and the revolving spreader a transversely moving shaker, for more thoroughly shaking out the bundles after the bands have been cut, and also in the construction and shape of the teeth on the web or belt that carries the bundles.

An improvement in plow handles has been patented by Mr. Friedrich Hacke, of De Soto, Mo. The handles of a plow are made in two parts, and are united by a suitably constructed adjusting splice, just below the curved parts of the handles. By this means the handles of plows are readily adjusted to suit short or tall plowmen, and the parts are more cheaply replaced when broken than when the handles are made in one piece.

TEXTILE INVENTION.

Mr. Albert Winter has patented a machine for folding cloth into layers of equal length from a roll or pile. Standards fixed to the sides of one end of a table have slots in their inner edges in which rollers are journaled. Similar standards are placed on a traveling frame at the opposite end of the table. In folding the traveling frame is placed at a suitable distance from the fixed standards, and the cloth is passed around the rollers alternately and secured at each end. The traveling frame is then moved from the fixed standards, and the cloth is stretched into even folds, and the rollers are then removed.

METALLURGICAL INVENTION.

Mr. William W. Waplington, of Halifax, Can., has patented improvements in gas furnaces for metallurgical purposes, and for melting glass in pots, etc., in which the gas producers, flues, valves, regulators, and working chamber are combined in one building, the object being to economize fuel and space, and to obtain an efficient furnace for the above named purposes, at a greatly reduced cost, consequent on the simplicity of construction.

MISCELLANEOUS INVENTIONS.

An improved folding clothes rack has been patented by Mr. George Seymour, of Boone, Ia. Four posts are connected in pairs by hinges, in such a manner that the lower ends of the pairs can be swung from each other. The end bars are hinged to the outer side of each of the posts, and their outer ends are hinged in a similar manner to an upright bar, the upper ends of these being connected by a separable hinge. When these hinges are separated the racks stand out radially from the center, and when the hinges are united, the bottoms may be separated to form an A shape, the sides being held in position by jointed bars.

A window sash and window frame, in which the sash will be held at any point in the frame without weights or similar contrivances, has been patented by Mr. Casper Lowenstein, of Columbus, O. The side bars of the sash are wider at the top than the bottom, and the window frame is provided with recesses, in which bars are placed, that are pressed out by suitable springs against the diagonal edges of the side bars of the sash, the springs exerting the greatest pressure below the center of the bars, and holding the sash at any desired position.

A device for holding hats in church or other places has been patented by Mr. John H. Burns, of Springfield, Ill. A clip composed of two plates pivoted to each other, their lower ends being held together by a spring coiled around the pivot, is hinged to a bar that is pivoted to a plate adapted to be secured to the back of a chair or church pew. This device holds a hat or cap securely and out of the way of the wearer.

Mr. Henry E. Hayes, of Brooklyn, N. Y., has patented an adjustable map supporter. The supporter consists of two clamps connected at one end by a crossbar, having a hand screw for attaching it to a chair or other support, and having eyes at the other end to receive a hollow cylinder that is provided with map suspending rods and a locking device for holding the rods in any desired position.

A novel fire escape has been patented by Mr. Diedrich Schmidt, of New York city. It consists of a derrick, pivoted to the inner surface of a wall and formed in hinged sections, so that the end of the arm of the frame can be swung out of the window opening to the outer surface of the wall. From the end of the arm a box, containing a folding ladder, is suspended, which drops from the box when the bottom is opened, permitting persons to pass down in case of fire.

A device for regulating the flow of sap from the reservoir to the evaporating pan has been patented by Mr. Charles F. Mansur, of Weston, Vermont. The sap flows from the reservoir through a pipe in a box containing a valve, and from this box into the evaporating pan. As the liquid rises in the pan, a portion of it passes into an auxiliary vessel containing a float. The float is connected by a rod to the valve of the supply pipe, and as the float moves upward the valve is carried upward also until it is pressed on the end of the supply pipe, closing it and stopping the flow of sap. As the liquid in the pan is boiled away the float descends, permitting the sap to flow from the pipe again.

An improved waiter, or bracket stand, for receiving dishes or plates, has been patented by Mr. Joseph T. McFarlin, of Middleborough, Mass. The stand consists in a standard, to which removable bracket plates or rings are held by means of projections on the standard and tongues and apertures on the rings, and also in a pie dish holder formed of two rings placed edgewise on the surface of the supporting ring, having slots for receiving a lifting handle.

A starch drying chamber, so constructed that the starch can be dried in less time and with less labor than by the ordinary methods, has been patented by Mr. George E. Full, of Charlottetown, Prince Edward's Island. The chamber has a slotted or perforated upper receiving floor, upon which the starch is thrown as it comes from the tanks. The finer portions fall through the slots of the floor on to drying frames below. These frames are either hinged or pivoted, in such a manner that when the starch is dry the frames may be tilted, or dropped, to discharge the starch into bins below them.

A device for securing pocketbooks, watches, etc., in the pockets of the owners, has been patented by Mr. Thomas B. Deniston, of Peru, Ind. A snap hook is attached to the pocket book or other article to be secured, and to the inside of the pocket, at the bottom, a wire or loop is fastened, to which the snap hook is hooked. The pocket book cannot be removed from the pocket without attracting the attention of the owner.

A mechanical device for catching fish has been patented by Mr. Thomas Heaton, of Vancouver, W. T. The device consists of an endless chain passing over two skeleton wheels, the shaft of one of the wheels being journaled in suitable supports placed on two connected boats, the other wheel being submerged in the water and suspended from the boats by suitable devices. The endless chain that passes over the wheels is provided with suitable nets for catching and elevating the fish. The device may also be used for gathering oysters, clams, etc.

An invention by which revolving heels for boots and shoes are made more firm and secure has been patented by Mr. Henry J. Johnson, of Philadelphia, Pa. A circular plate is secured to the stationary heel, and has attached to it a spring latch pin that engages with a series of holes in a circular plate secured to the top of the revolving heel and holds the heel in any desired position. The plates are connected by suitable devices to hold them securely to each other.

Improvements in velocipedes have been patented by Mr. Cephas Shelburne, of Johnson City, Tenn. The velocipede may have three or four wheels as desired. The treadles are connected with rocking levers, by pivoted connecting bars. The rocking levers are provided with pawls that engage with ratchet wheels placed on the shaft of the driving wheels. By these means when the treadles are operated by the feet the wheels are revolved.

A universal tool handle has been patented by Mr. Thomas Bates, of Janesville, Wis. The handle is hollow, and has at one end a heavy metal ring. Two jaws are hinged at their inner end to a screw threaded bolt that enters a nut secured to and turning on the butt end of the handle. The hinged jaws are grooved on their inner surfaces, and have flanges on their outer sides by which the hinged parts are closed or released when the nut at the butt of the handle is turned.

Mr. William G. Harper, of Unionville, O., has patented improvements in the hind hounds of wagon running gear by which they are made more economical and durable than those of ordinary construction, The improvements consist mainly in such a combination and construction of the axle and bolster, and brace rods and hounds, that they are all properly united and strongly held without cutting or notching any of the parts.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) W. A. P. writes: The following question has arisen and been discussed by a good many of the men in our town. We have found we cannot come to any conclusion, and have decided unanimously to leave the question to you, if you will be so kind as to answer it. Does the follower head in the cylinder of a locomotive run back and forth, or does it have any other than a forward motion? My idea is that when the crank pin on the drive wheel moves above the level of the axis of the drive wheel, the follower head runs over ground faster than the cylinder, and therefore gets to the forward end of it. But when the crank pin passes below the level of the axis, the follower head still has a forward motion, but it moves slower than the cylinder, and instead of the follower head moving back, the cylinder moves forward away from it until it is at the back end. A. The crank pin and piston of a locomotive never move backward relatively with the track, except when the wheels slip. The pin and piston in their upper and forward stroke, from dead point to dead point, move forward, a distance equal to one half the circumference of the wheel, plus the length of the stroke or twice the length of the crank, while in the lower and return stroke, from dead center to dead center, they also move forward relatively to the track a distance equal to one-half the circumference of the wheel, minus the length of the stroke or twice the length of the crank. This is true for all lengths of crank within the radius of the tread. If the crank pin should be placed exactly at the periphery the piston would stand still for an instant at the middle of the return stroke, and if it be placed beyond the periphery, the piston would have a reverse motion at the middle of the return stroke.

(2) E. R. D. asks (1) how to pulverize phosphorus. A. Triturate it with some chloroform in a mortar until dry. It will not remain in this condition long, and must be kept very cool to avoid its ignition. 2. How to make a solution to get a surface with paint. I wish to apply it to illuminating, such as is done on the illuminated match safes. A. Turpentine spirits is the best practical solvent for this purpose, or linseed oil. A mixture of this kind cannot replace luminous paint. 3. Also by what process do match makers get phosphorus to the proper consistency to dip matches in? A. Glue or gum, and the solvent action of the other ingredients, sulphur, etc.

(3) J. E. H. writes: 1. I have a good stout boat, 24 feet long, 9 feet beam, with flat bottom. I wish to apply steam to it as a propelling power, and wish to know the most advisable manner in which to do it. I wish it only as a family and sporting boat, to be used in smooth water, and five or six miles an hour would be fast enough. What size engine shall I use and what size screw as propeller? A. Apply a screw propeller; engine about 4 inches or 4½ inches diameter of cylinder, by 5 or 6 inch stroke. 2. Would any of the small stationary engines do for it? A. Yes, if not too high or too heavy. Your boat will have a light draught of water, and the screw will be, say, one-third of its diameter out of water.

(4) B. T. writes: We are putting up two boilers, 36 inches in diameter, 26 feet long, with two 12-inch flues in each boiler. What should be the size and height of chimney? The boilers are second hand, and are badly scaled with rust on the inside. Will you please give us some plan for removing it? A. Twenty inches square, and 50 to 56 feet in height above boiler. As your boiler is second hand, it should have very careful examination outside and inside before putting it in use.

(5) "Subscriber" asks: 1. Does not a small boat have more water surface in comparison to its size than a large one? A. Yes. 2. Which gives the greatest speed, the side wheels or the screw propeller? A. For light draught steamers the wheel, and for deep draught ocean-going steamers the screw.

(6) A. B. F. writes: 1. I desire to become an engineer on an ocean steamer. I have had experience in using stationary engines, and have made such things a study. How is the proper way to learn? A. You should first get a position as a junior assistant. 2. What pay do first class engineers get now? I am twenty-two years of age, and have had a good education, have graduated from one of the best academies in the State. A. Chief engineers of sea-going steamers get from $100 to $150 or $200 per month, depending on the class of steamer and length of route.

(7) E. D. E. asks: Who built the first railroad, and in what year was it built, and between what cities? A. The first railroad was from Quincy, Mass., to a granite quarry, and was used for transporting stone, and was completed in 1827. The work of the Baltimore and Ohio Railroad was commenced in July, 1828, and the first steam locomotive run on it in summer of 1829.

(8) W. K. writes: I am running an upright tubular boiler, 58 inches inside diameter. 19 feet surface (grate), 179 two inch tubes, and have to run a 35 horse engine, cutting off half-inch stroke, 70 pounds boiler pressure. Boiler is about 38 or 40 horse nominally. What I want to know is, what is a fair amount of coal to burn in ten hours' work to run the above? Boiler holds her steam well, but has small steam room. By a careful calculation, for a day's run I have burned about 150 pounds coal per hour. Is that too much or not? A. We consider 150 pounds a fair consumption. It might run from 125 to 165 pounds, according to the style and condition of the engine.

(9) A. D. F. asks: 1. What speed should a twenty-four inch diameter grindstone be run to do the best and most work? A. A twenty-four inch stone for machine shop use should run about 100 revolutions per minute, or just fast enough to retain the water. "Professional grinders" doing special work sometimes run as high as 150 to 200 turns per minute, and accomplish the most and best work. At this speed protect yourself against the accident of a bursting stone and flying water. 2. What is meant by vertical "direct acting" as applied to steam engine? A. "Direct acting" engine has piston rod and crank, connected by a pitman or single rod, as distinguished from a "beam engine." 3. Why are the upright posts or pillars on the Brooklyn Bridge higher in the middle than on the edge? A. The truss work upon the bridge is made higher in the center to accommodate an elevated footpath. 4. Why do masons always leave the mortar out of the center of a stone window sill? A. Stone window sills are set hollow, or with mortar at the ends only, to prevent breaking by the compression of the piers, and are generally closed up, or pointed, before a building is finished.

(10) J. E. K. writes: I am desirous of starting a stationary steam saw mill (circular) at this place, and intend at no distant day to attach a grist mill thereto, to be run separately, unless business will justify me otherwise, and one person advises one style, another advises another style, and I therefore apply to you to solve the perplexing question. Would it or not, be more economical, better or cheaper, taking all things into consideration, to get an engine, say 24-inch stroke, stationary horizontal style, than to get one of a shorter stroke, and run it at a greater speed, and to put a pulley wheel upon each engine large enough to drive the saw the same number of revolutions (say 600 per minute), the longer stroke engine to have the larger pulley wheel, in proportion to the speed of the same necessary to run the saw the required velocity? Would 100 revolutions per minute for an engine, 8 or 9 by 24, be too fast for it to run? For such work would you advise me to get a vertical or horizontal engine? If a vertical, which style, with wheel at the top or bottom? A. We would advise a horizontal engine. If 24 inch stroke, 100 revolutions per minute is not too fast. Use pulleys for speeds required. 2. What is the lightest gauge, solid tooth circular saw that can be used with safety in a general lumbering business (or for sawing all kinds of logs), saw to be 56 inches? A. In regard to saws write manufacturers who advertise in our columns.

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August 22, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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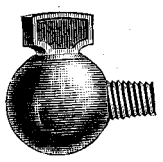

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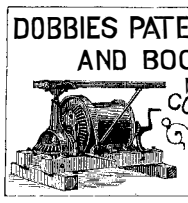

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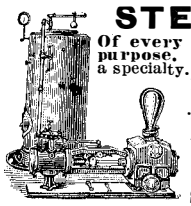

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120 Come, Sit by My Side, Darling.
121 Kiss Me; Kiss Your Darling.
123 A Flower from Mother's Grave.
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130 Coming Thro' the Rye,
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138 The Kiss Behind the Door.
139 I'll Remember You, Love, in My [Prayers.
146 You May Look, but Musn't Touch.
150 There's Always a Seat in the Parlor for You.
152 I've no Mother Now, I'm Weeping
158 Massa's in de Cold, Cold Ground.
159 Say a Kind Word When You Can.
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252 Darling Nellie Gray.
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292 Man in the Moon is Looking.
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300 My Little One's Waiting for Me.
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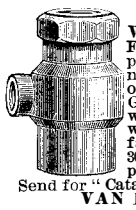

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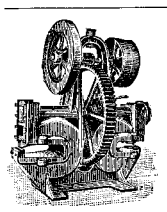

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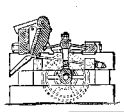

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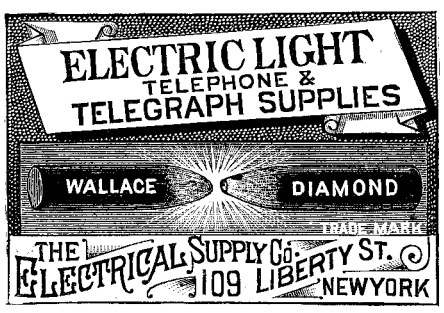

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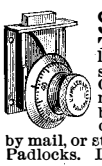

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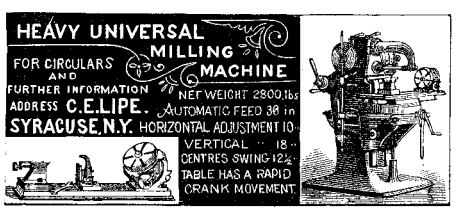

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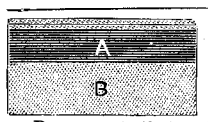

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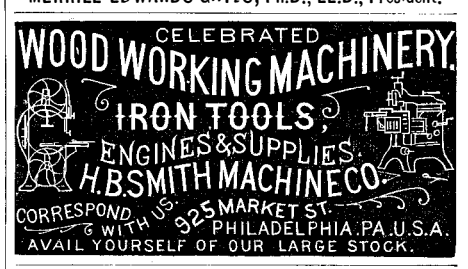

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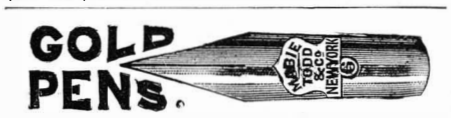

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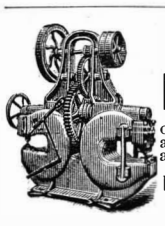

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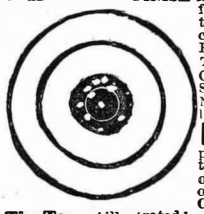

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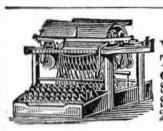

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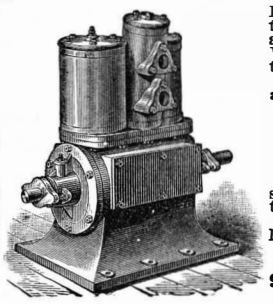

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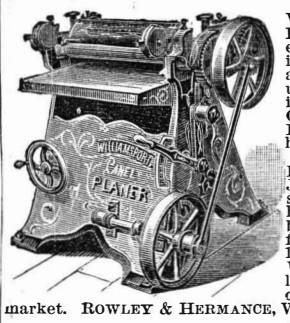

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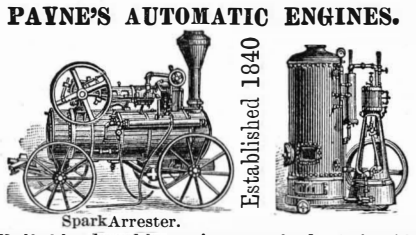

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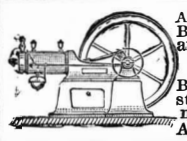

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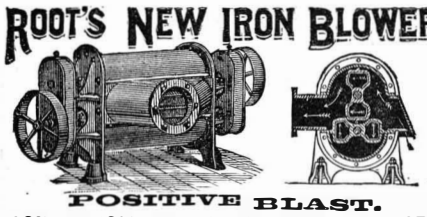

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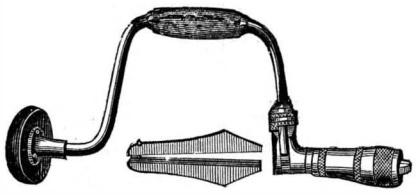

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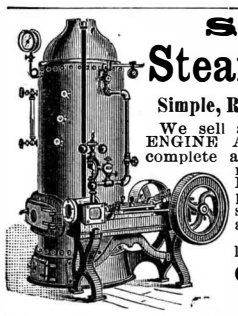

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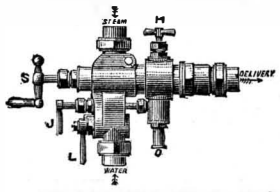

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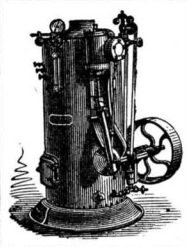

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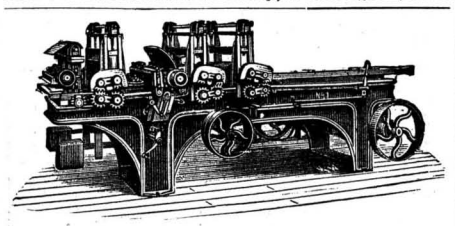

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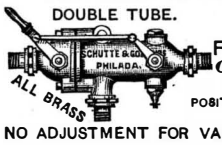

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